The Chemical Age

VOL. LXI 24 DECEMBER 1949 No 1589

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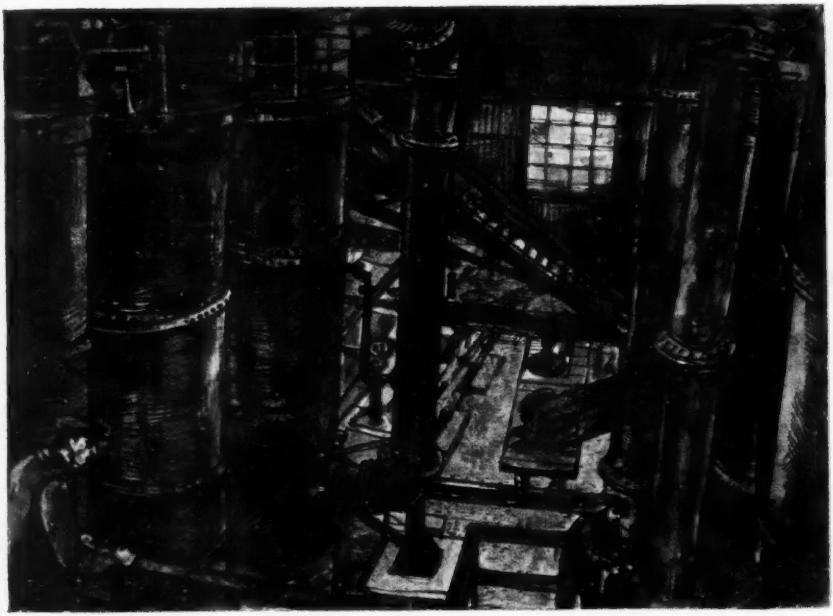

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The
Chemical Age

The Weekly Journal of Chemical Engineering and Industrial Chemistry

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Volume LXI 24 December 1949 Number 1589

Chemical Engineering Research

WHILE the chemical engineer is in the fortunate position of being able to take advantage of the results of researches in the pure sciences and of complimentary developments in mechanical, civil and electrical engineering, he is nevertheless handicapped by the very limited amount of original work going on in his own particular field. Much of the delay in applying to industrial uses the results of new scientific discoveries, to which Sir Henry Tizard and others have recently drawn attention, is, in fact, due quite as much to the want of adequate facilities for this kind of development as to the lack of qualified people to undertake it. With the inauguration of undergraduate and post-graduate courses in chemical engineering at some universities, the building up of schools of research in this subject has now become possible; and, provided a close and effective collaboration between the universities and industry can be established, an important step will have been taken to close the gap which at present exists between the laboratory and the works.

In promoting the systematic training of chemical engineers and in providing in its *Transactions* a forum for the discussion of subjects of interest to chemical engineers in general, the Institution of Chemical Engineers is supplementing the efforts of the universities and is ensuring the maintenance of a high standard of professional qualification among its members. That service is preserving and enlarging the ideals of the founders, the group of eminent chemical engineers, among whom was the late Professor W. Hinchley, who were brought together during the 1914-18 war. Professor Hinchley was also responsible for establishing the first post-graduate course of chemical engineering at the Imperial College of Science in 1921 and some 15 years later his successor, Professor S. Ure, was instrumental in organising the first undergraduate course leading to the degree of B.Sc. (Eng.) in Chemical Engineering at London University. Other universities have since established similar courses—notably Birmingham under Professor Garner, Leeds under Professor Roberts and Cambridge under Professor Fox.

The setting up of these schools was a most welcome recognition, if overdue, of the important role of the chemical engineer in industry. The economic situation of the country is admitted to

On Other Pages

The annual subscription to THE CHEMICAL AGE is 30s.; single copies, 9d.; post paid, 1s. SCOTTISH OFFICE: 116 Hope Street, Glasgow (Central 3970). MIDLANDS OFFICE: Daimler House, Paradise Street, Birmingham Midland 0784-5). THE CHEMICAL AGE offices are closed on Saturdays in accordance with the adoption of the five-day week by Benn Brothers, Limited

require among the prime essentials for recovery all possible additions to industrial efficiency and the introduction of new techniques and new products. Industry requires a steady influx of highly trained technologists and engineers, and it is principally to the universities that it looks to meet the demand.

We have recently had the opportunity of discussing with Professor Newitt, Courtaulds Professor of Chemical Engineering at the Imperial College, the provision for training there. The college, as has been mentioned, offers a 4-year undergraduate course in chemical engineering and a two-year post-graduate diploma course for graduates in chemistry, physics or engineering. The two systems of training produce men of rather different qualifications, although both find places in industry and both have the fundamental scientific background which, combined with practical experience, produces a fully qualified chemical engineer. Professor Newitt stressed the importance of establishing, in parallel with the formal instructional courses, schools of research in which post-graduate students can receive training in the methods of research by investigating on a pilot plant scale fundamental problems concerned with the design of plant and the operation of basic processes.

He has some fifteen research students working at the Imperial College of Science on such problems as heat transfer at low temperatures, the mechanism of the drying of solids, pneumatic and hydraulic conveying of solids, mixing and agitating and distillation. In connection with this work, he is endeavouring to collaborate as far as possible with industry to ensure that students are brought as early as possible into contact with the practical side of their problem. This he regards as an essential part of the students' training and also as offering benefits to industry, inasmuch as it enables the practising chemical engineer to keep in touch with the universities.

All these measures, excellent as they are, obviously must be regarded only as the prototypes of the much more ample programme which will be required if chemical engineers are to be provided in the numbers, and with the attainments, which the present evolutionary stage of chemical-cum-physical science so urgently requires.

Notes and Comments

Instruments and Chemicals

THE knowledge that practical advances in chemical industries often depend for their usefulness upon the enterprise of the instrument makers finds probably its best expression in the U.S.A., where the 22nd Exposition of Chemical Industries is reported to have represented in its instruments sections an innovating spirit matching anything the producers of chemical products and intermediates could show. It has been estimated that of all the new items assembled in New York more than one-quarter were in the instruments category. While the close integration of makers and users of instruments which has permitted the former to anticipate industries' needs of such things as radioactivity recorders is certainly not confined to the U.S.A., it seems evident that it has reached a much more advanced stage there than it has anywhere else. That is undoubtedly one of the prime factors which have given the U.S.A. its unmistakable lead in the production on commercial scale of some new industrial materials which might otherwise have remained merely laboratory curiosities. The fruits of that seem to have had ample evidence in New York. The result cannot be dissociated from the fact that the making of recording and monitoring devices has become one of the most remunerative of American specialist industries, and so is able to carry research staffs fitted to provide rapid answers to the kind of problems encountered in enterprises such as the economical synthesis of desoxycholic acid (for cortisone) and the workshop use of beta-ray emission. It is worth noting, as another example of the integration doctrine flourishing in spite of the keenest sort of competition, that during the exposition more than 50 films were shown, many of them unreservedly recording complete chemical operations or special processes in commercial use.

Looking Ahead

WHERE would the steel technologists, the chemists and a host of others come from were anything to divert the self-renewing stream of unpaid private enterprise, which has been carrying on with all the tools which science has afforded the traditions of the antique crafts and guilds? The problem, fortunately, is a hypothetical one, because all the evidence points just now to the existence of a keener and more practical appreciation of the need to catch—and train—the young intake in numbers large enough to maintain all the objectives which research and development have captured. Training the surplus of specialists who must take the next objectives, if there are to be any, is less easily assured. Such reflections are brought to mind by, among other things, the modern activities of the iron and steel industry, which has never permitted the knowledge that it is supposed in the near future to become a Whitehall department to frustrate its recruitment programmes, represented by the British Iron and Steel Federation's Recruitment and Training Committee and other far-sighted schemes of the same kind. The enterprise of that committee is manifested by the variety of means it employs to implant the right ideas in soil in which more advanced ones may be expected one day to germinate —by exhibitions, film shows, training schemes and exchange visits overseas for young steel workers. Something of this was revealed at the recent steel industries' conference at Ashorne Hill by Mr. Gerald Steel (United Steel Companies, Ltd.), who emphasised the responsibility of management to ensure that talent is secured and encouraged wherever it is found.

Careers for Chemists

THE steel industry is fortunately not alone in its concern for this precious addition to the country's real assets. The same missionary spirit

animates the groups within the Royal Institute of Chemistry which are now spending evenings in various parts of the country telling children and students about "Careers for Chemists." They are bringing to that far from simple task what appears to be a rare combination of realism—represented by rewards, advancement and material prospects in general—and of idealism sufficient to make it clear the profession of chemistry is not "just a job."

Transatlantic Spelling

SPELLING has always been something of a problem in chemistry, especially in its international aspects, and in recent years there has been a noticeable infiltration of American style into papers published in English, occasionally in this country, but more particularly in translations from abroad, and not necessarily from the U.S.A. The latest move in this trend to change our familiar spelling is the reiterated recommendation of the American Society for Testing Materials and the Institute of Petroleum to spell the word kerosene with "ine" and not "ene", a standardisation which they attempted to enforce nearly 25 years ago. The relative antiquity of the argument does not seem to provide any good argument why we should succumb to American influence. Equally, it may be asked, is it to be sulphur or "sulfur"? Aluminium or "aluminum"? There is, of course, a host of similar examples in which we agree to differ. If a uniform spelling is desirable between the English-speaking (and writing) nations, an equally good case could be made for the retention of the style which was familiar to all long before North America had any interest in kerosene or sulphur and the rest. It remains only for some disgruntled party to remit the dispute to UNO—when Britain would have good grounds for adopting the familiar Soviet technique of applying the veto!

A Wish for Christmas

THE CHEMICAL AGE, hastening to press with the prospect of four days' cessation of all publishing problems, wishes readers a happy and tranquil Christmas, far removed from all preoccupations with processing—other than those associated with the heat treatment of turkeys and the subsequent exercises in domestic detergency.

A New Source of Bitumen for Europe

BULK shipment of bitumen from Curacao, in the Netherlands West Indies, to Denmark and Portugal has been planned by the Shell organisation and it is hoped to satisfy by the extension of this scheme about 60 per cent of Western Europe's demand. Expansion of road construction activities and a revival of industrial building are expected to account for a considerable increase in consumption generally.

Construction of the necessary bulk receiving depots has already begun for Shell in Denmark, at Copenhagen, and in Portugal, at Setubal, near Lisbon. At these 6000-ton storage depots, each of which will cost about £120,000, the bitumen, which is to be shipped in two basic grades, will be manufactured into a wide range of products.

To overcome the problem of transatlantic shipment of "hot" bulk bitumen, Shell has converted three 9000 d.w.t. tankers at a cost of £30,000 each, in which the centre tanks, with a capacity of about 4500 tons, have been specially equipped with coils and fitted with jacketed lines and pumps. The balance of the cargo in the wing tanks will consist of black oils.

Previously, in Europe, bulk shipment has been confined mainly to haulage of locally manufactured bitumen by small carriers of 2000-2500 tons, which now operate mainly between France and the North African coast. Modernisation of the French bitumen fleet is, however, contemplated and plans include two 3000 d.w.t. special bitumen carriers, expected to be in service by 1952.

Under the existing system of distribution in Europe the product has been supplied both in drums and in bulk. Drums are necessary because some grades cannot be economically transported in bulk, but bulk purchase eliminates the cost of the containers. The product is also easier to handle since decanting and re-heating are unnecessary.

CIBA AND M. & B. APPEAL

House of Lords Reserves Judgment

AFTER a hearing lasting three weeks, the House of Lords on Thursday last week reserved judgment in an appeal by May & Baker, Ltd., of Dagenham, and Ciba, Ltd. (formerly the Society of Chemical Industry in Basle) in connection with letters patent granted for the manufacture of new benzene sulphonamide derivatives. The appeal was against an order of the Court of Appeal affirming a decision of Mr. Justice Jenkins, refusing a motion for leave to amend the specification of the patent by limiting it to sulphathiazole and sulphamethyl-thiazole. The motion had been opposed by Boots Pure Drug Co., Ltd., whose petition for revocation of the patent was granted by Mr. Justice Jenkins.

Sulphathiazole

Mr. Basil Drewe, K.C., for the appellants, explained that the proceedings concerned a patent originally applied for in Switzerland by Ciba but subsequently granted jointly to them and to May & Baker. The lower courts held that the proposed amendment would make the specification claim an invention that was substantially different from that claimed in the unamended specification. His contention was that that was not so, since the specification, whether amended or unamended, was founded on the same inventive step—namely, the therapeutic value to be derived from the incorporation of the thiazole group in the sulphonamide molecule.

"New Invention"

Mr. Lionel Heald, K.C., for Boots, said the invention published by Ciba was not a chemo-therapeutic invention but merely a claim to a very large body of entirely new chemical substances, with an instruction as to how they could be made. Although the appellants sought to cut out the broad claim of their original invention, they were not cutting out the broad statement and leaving a narrower statement as one might expect but were completely altering the statement. That, he submitted was a considerable step towards having a new invention.

[The original Letters Patent (No. 533,495), with which the long-drawn out legislation is concerned, was based upon recognition of the great therapeutic properties of sulphathiazole. The claim, however, related to several different processes and embraced a product claim for

(*continued at foot of next column*)

"benzene-sulphonamide-thiazole derivatives whenever prepared or produced by the manufacture particularly described and ascertained herein or by any process which is an obvious chemical equivalent thereof."

The "substituent capable of conversion into an amino group" used in the preceding claims referred to acylamino, nitro, nitroso, azo or hydrazo group or a halogen atom. According to Boots Pure Drug Company, at the original hearing, the claims in this patent might afford protection to approximately 97 million compounds.]

FLUORINE CASE REOPENED

Aluminium Company in Court

THE legal proceedings based on the complaint of the petitioners, Ben Nevis Distillery Company (Fort William), Ltd., and its managing director, Joseph William Hobbs (THE CHEMICAL AGE, 59, 778, 847; 60, 250, 251, 431) that fumes from the large plant of the North British Aluminium Company were causing serious harm to animal and vegetable life were revived at the Court of Session, Edinburgh, on December 15.

Counsel for the petitioners alleged that the aluminium company was not fulfilling its undertaking—to make remedial alterations with all possible expedition—and urged that it had forfeited any claims to indulgence. It was "pathetic" he said that this "enormous firm" had managed to produce only 18 new furnaces in a year when it had to reconstruct 184.

Eighteen New Furnaces

Officials of the aluminium company were doing everything to improve the position by the speediest possible installation of new furnaces, claimed Mr. W. R. Milligan, representing the aluminium company. It was emphatically denied that remedial measures could be considerably hastened. There were supply, labour, and time difficulties; but by July 18 furnaces of a new type were in operation and a further 32 old furnaces had been dismantled.

On the ground that the Ministry had not complied with legal procedure in the process of the case, Mr. W. Grant, who sought to intervene on the instructions of the Ministry of Supply, was refused permission to speak on the dispute. Lord Birnam reserved judgment in the case, and allowed Mr. Grant a week in which to lodge representations on behalf of the Ministry.

Fewer Import Restrictions

Further Relaxations Announced

IN accordance with the agreement with the OEEC for the liberalisation of trade, the removal of import licensing restrictions from a further wide range of goods was announced last week.

The new relaxations, with certain exceptions, become effective from January 5, 1950, and will apply as in the case of the previous announcements to goods imported from any country other than :—

The U.S.A., Canada, the Philippines, the dollar account countries of Central and South America (Bolivia, Colombia, Costa Rica, Cuba, Honduras, Mexico, Nicaragua, Panama, Venezuela), Argentina, Uruguay, Japan, Iran, Tangier, the French Somali Coast, Liberia, the U.S.S.R., Rumania, Bulgaria, Hungary, Czechoslovakia, Poland, the Russian Zone of Germany, Jugoslavia, Albania, Belgium, Belgian Congo, Luxembourg, Switzerland, Western Germany.

These further relaxations help to discharge the Government's obligations under the OEEC decision of November 2.

Chemical Materials

For foodstuffs, the existing relaxations already account for 83 per cent. In the manufactured goods group the relaxations will now extend to something over 50 per cent of imports in 1948 from all the participating countries. In the raw materials group the relaxations will now extend to some 68 per cent.

The official list of materials, etc., to be freed from import restrictions includes these :—

GROUP 2 (MINERAL PRODUCTS AND METALS).—Abrasives : Aluminous oxide (fused), corundum (natural), diamantine powders, emery, garnet concentrates and grain, microdol (micronised dolomite), pouncing flints, being crushed and graded quartz, pumice, shot and grit of iron or steel, silicon carbide, Tripoli powders, Vienna lime.

Aluminium and aluminium alloy ingots (secondary), containing more than 50 per cent by weight of aluminium, asbestos manufactures, asphalt and bitumen (natural), brass, bronze (including aluminium bronze) and gunmetal in the form of ingots (50 per cent or more of copper), building bricks and hollow blocks manufactured from clay, cement (calcareous), coal-tar and coal-tar pitch, corhart bricks and blocks.

Ferro-alloys of aluminium, beryllium, boron, carbon titanium, cerium, cobalt, copper, manganese, molybdenum, nickel, phosphorus, selenium, sulphide, titanium, tungsten, vanadium, zirconium (more than 10 per cent of zirconium).

Manufactures wholly or mainly of non-ferrous metals and their alloys (excluding uranium, precious and rare earth metals) : Wrought bars, rods, shapes, sections and wire ; wrought plates, sheets and strip exceeding 0.006 in. in thickness ; tubes, pipes and hollow bars of all sections.

Metals : Antimony, calcium, cobalt compounds, manganese, molybdenum, tungsten, vanadium, molybdenum powder, Mullite (calcined kyanite or cyanite).

Ores and concentrates of beryllium, bog ore, cobalt, iron, manganese, tin, zinc.

Quartz, raw rock crystals and slabs, not processed ; refractory or heat insulating bricks and blocks ; scrap metals, residues and wastes fit only for the recovery of metal (excluding scrap containing precious metal) ; silica sand, tungsten powder.

GROUP 3 (OILS, WAXES, ETC.).—Gums and resins : Dragon's blood, gamboge, locust bean, shiraz, oiticica oil (raw), resin (colophony), rosin (hydrogenated or polymerised), turpentine.

GROUP 5 (CHEMICALS, DRUGS, MEDICINES, ETC.).—Abietic acid, barium chloride, bicarbonate of soda, borax, boric acid, caustic soda, charcoal (other than activated or decolorising), inks, iron oxide (natural), lamp black, locust bean kernels, paints, painters' enamels, lacquers and varnishes, including pearl essence, potassium carbonate, soda ash, sodium chlorate, tannic acid, ultramarine blue, zirconium oxide (natural).

GROUP 8 (GAS AND CHEMICAL PLANT).

GROUP 16 (TANNING MATERIALS).

Token Imports in 1950

THE Board of Trade has announced that it has been decided to continue the Token Import Scheme in 1950 on the same basis as in 1949. The annual quota will remain 20 per cent by value of each individual manufacturers's average trade in the commodity with the United Kingdom in 1936-38. Participants are Australia, Belgium and Luxembourg, Canada, Denmark, Finland, France, Holland, India, Norway, Pakistan, Sweden, Switzerland and the U.S.A.

The consolidated list includes paints and varnishes, bone black, porcelain enamel frit, medicinal preparations for retail sale under proprietary or trade names, and meta fuel; petroleum jelly preparations, shampoos and laundry soap.

Anglo-Swedish Talks in 1950

ANGLO-SWEDISH trade discussions were concluded in London last week after a review of the probable trend of trade and payments for 1950.

The United Kingdom is again to import timber, pulp, paper, and iron ore from Sweden, as well as various manufactured goods and machinery. Swedish exports to the United Kingdom in 1950 may be worth about £60 million.

The Swedish import programme will also cover a wide range of U.K. products, including chemicals (£6 million). It is hoped that U.K. exports will reach a value of at least £73 million for the year. The issue of import licences will commence as soon as possible.

AMMONIA FOR RESEARCH

Study of Energy Levels

THE increasing importance of ammonia in the scientific world as a precision research tool is pointed out by Dr. W. D. Hershberger, of the department of engineering, University of California, Los Angeles, U.S.A. The first important practical application was the atomic clock (THE CHEMICAL AGE, *60*, 189), whose principles Dr. Hershberger helped to develop while he was a member of the research laboratories of the Radio Corporation of America.

The atomic clock's accuracy (it loses no more than three seconds a year) is due to a stabilising device employing ammonia gas and a microwave generator. This same stabilisation effect may be utilised, states Dr. Hershberger, under field conditions for calibration of delicate radar instruments.

The absorption of microwaves by the ammonia molecule is also proving to be an excellent research tool for structural chemists. It is particularly valuable in studying extremely small differences between energy levels in molecules, atoms, or nuclei and the life time of excited molecular states. Such a tool also should find application in studies on chemical reaction rate in gases, Dr. Hershberger says.

Calcium Carbide Prices

IT is officially announced that revised prices will come into effect as from January 2, 1950, for calcium carbide sold through the Carbide Distributing Agency, Ltd., 55 Gordon Square, London, W.C.1. Simultaneously a new service of direct deliveries from factory to users for lots of one ton and over will be inaugurated.

Prices per ton of 2200 lb., packed in 220-lb. drums, deliveries to users direct from factory, range between £28 8s. 9d. and £26 8s. 9d. for grades of 50/80 mm. down to 2/4 mm. in 4-ton lots and over; for 1 ton but under 4 tons, £28 18s. 9d. to £26 18s. 9d. Deliveries to users from merchants' warehouses, 4 tons and over £30 8s. 9d. to £28 8s. 9d. (reduction ranging from £2 5s. to £4 5s.); 4 cwt., but under 4 tons, £30 18s. 9d. to £28 18s. 9d. (reduction from £3 10s. to £5 10s.); under 4 cwt., £31 8s. 9d. to £28 8s. 9d. (reduction from £4 to £6).

Calcium carbide packed in 100 lb. or 110-lb. drums will cost £1 per ton more in all cases.

NICKEL BROMINE DRUMS

Replacing Lead in U.S.A.

SATISFACTORY container materials for dry bromine have, after extensive tests, been recommended by the Metal Packages Committee of the U.S. Manufacturing Chemists' Association to the Bureau of Explosives. Objections have been raised to lead-lined drums, the conventional bromine shipping containers, because of their heaviness, cost and liability to corrosion; they are also difficult to examine for leaks owing to the nature of their construction.

An investigation was undertaken which showed that nickel or Monel metal drums can be constructed to eliminate these disadvantages. Corrosion tests carried out and the design of a suitable type of drum are described in detail by Mr. George S. Haines, of the Food Machinery and Chemical Corporation (*Industrial and Engineering Chemistry*, *41*, 2792-97). Drop tests were claimed to show excellent impact resistance, with no evidence of leakage.

An addition to the Interstate Commerce Commission regulations now permits the use of nickel or Monel drums of not over 10-gal. capacity and containing not more than 225 lb. net of bromine (in compliance with other U.S. Standard requirements).

Pilkington's to Open in Canada

PILKINGTON Brothers, the St. Helens glass manufacturers who provide nearly all British flat glass exports, are to build a factory in Canada at a cost of $3 million. Canada is one of the largest markets for Pilkington's; last year flat glass exports from this country exceeded £4,250,000 in value. Canada has been taking nearly a quarter of that amount. Pilkington Brothers have had interests in Canada for some time, and there was a move before the war to start production there, but changes in the Canadian tariff altered the prospects. The new Canadian factory will be built on the outskirts of Toronto, and is expected to be in production by 1951. Up to the end of August last, imports from the United Kingdom were valued at $1,396,000, and from the United States $1,534,000. Another flat glass factory is being built by Pilkington Brothers in South Africa, and will be in production early in 1951.

AMERICA'S NEW CHEMICALS & EQUIPMENT

Advances Shown at Chemical Industries Exposition

REFLECTING the marked progress that has recently been made in the evolution of new chemicals and in chemical processing and methods of evaluation on all fronts, the 22nd Exposition of Chemical Industries in New York (November 28 to December 3) fully lived up to its aim to provide a common meeting ground for management, research and production personnel, of whom more than 45,000 attended.

The scope of the exposition included everything required to bring the research laboratory or the chemical processing plant completely up to date, and offered many newly isolated substances for experimental purposes. There was an increased readiness to develop new appliances for investigation, new machinery for advanced lines of manufacture, and even to design and build whole new chemical plants.

New chemical substances and newly tested forms of some of the older and better known bases played a dominant rôle in the exposition. The General Aniline and Film Corporaton, New York, offered iron pentacarbonyl in liquid form and carbonyl iron powder. The carbonyl iron powder has proved effective experimentally as a catalyst in the Fischer-Tropsch reaction for gasoline, and the liquid, pentacarbonyl as a substitute for tetraethyl lead, the anti-knock agent for motor fuel. In the powder form it is a standard component of the cores in television sets and in electronic instrumentation. The carbonyl iron powder has a particle size equivalent to fine talcum powder and contains no metallic impurities. The particles are spherical and have a shell structure.

Powdered Metals as Fuels?

Aluminium, magnesium and alloy powders are being widely adopted as chemical reagents and in the manufacture of protective coatings. One of the newest applications in this field is the use of unpolished aluminium powders as jet-engine fuels. (The Magna Manufacturing Company, Haskell, New Jersey.) No jet aircraft has yet been flown using powdered metals in place of conventional petroleum fuels, but the principle is the subject of research by the U.S. National Advisory Committee for Aeronautics and the U.S. Air Force.

Desoxycholic acid, the most important intermediate in the production of cortisone (Compound E), was shown for the first time by Winthrop-Stearns, Inc., New York, which claims to have developed a synthetic process which increases and makes more economical the production of desoxycholic acid from ox bile.

Another innovation, by the Atlas Powder Company, Wilmington, Delaware, was the production in commercial quantities of 97 per cent stearic acid, with iodine values less than 0.5 per cent, unsaponifiables less than 0.2 per cent.

New Insecticide

The Hercules Powder Company, Wilmington, Delaware, have developed the new member of the rosin and turpene family, toxaphane, an agricultural insecticide toxicant which has come into prominence since the last chemical show two years ago. Synthetic resins for paints, varnishes, adhesives; chemicals for the petroleum industry and for use in the manufacture of synthetic rubber, are other derivatives whose principal source is the stump of the southern pine, which is currently yielding scores of useful chemicals.

Hercules also reported progress in developing cellulose products from cotton linters. From "chemical cotton" come the new flame-resistant cellulose acetate base for hundreds of plastics products, nitrocellulose base for lacquers, sodium carboxymethylcellulose, the CMC used in modern detergents, and now cumene hydroperoxide for "cold rubber," and a chlorinated rubber base for chemical resistant paints.

The Carbide and Carbon Chemicals Corporation displayed for the first time some of the earliest products made from Dynel, a new wool-like synthetic fibre spun from a copolymer of acrylonitrile and vinyl chloride. The company also presented a new family of synthetic fluids and lubricants, primarily for industrial purposes, differing chemically and in performance characteristics from petroleum oils, animal and vegetable oils, silicones and other synthetic oils. The new products are reported to have little effect on most natural and synthetic rubbers and common gasket materials, and to be inert to the common metals, and there is little change of viscosity with change of temperature.

Revolutionary changes in filtration

principles are no longer looked for, so that the relatively numerous modifications shown in New York have commanded much interest.

To eliminate metallic pickup and for use where liquid to metal contact is objectionable, Ertel, a hard rubber filter is being offered. The hard rubber frames were designed to eliminate breakage of the sheets (either filter paper or asbestos filter sheets). One model is a 10-disc unit having 2350 sq. in. of filter surface, and there are 100-disc units having ten times the capacity. Filtration capacities, based on viscosity of water and on filter sheet density, range from 5 to 50 g.p.m.

Multi-Purpose Filter

For filtering plating solutions and chemical liquids, the same company (Ertel Engineering Corporation) displayed its cylinder type multi-purpose disc filter. This has independently tightened filtering elements to provide a positive seal and permit use of various types of filter media; and a cylinder closure, so that after the filtering elements have been sealed the outer cylinder, independent from the filtering unit, is easily closed. The filter is built in sizes to accommodate from four to 30 asbestos filter discs, filter cloths or filter paper. Because of the enclosed principle there is no loss of liquids due to evaporation or drippage.

Titeflex, Incorporated, Newark, New Jersey, displayed industrial and laboratory filters distinguished by (1) simplified backwashing, to facilitate cleaning; (2) high pressure pumps, to permit efficient operation over longer periods of time; and (3) permanent filtering elements employing a filter aid. The equipment is cleaned by backwashing (reversing the flow through the membranes). Cleaning is completed in a few minutes and manual removal of residue is unnecessary.

A continuous centrifugal filter for separation of solids from liquids, offered by the Bird Machine Company, South Walpole, Massachusetts, dispenses with cloths, vacuum, filter media or auxiliaries, and deals with a wide range of feed slurries. Solid content may be coarse or fine (from a fraction of a micron to ½ in. or coarser), and may be hot or cold. The average liquid retention is said to be less than a minute and solids are handled in 15 seconds. Continuous, precisely controlled application of centrifugal sedimentation is the basis.

The display of instruments and controls amply demonstrated that instrument makers are providing the tools required for research as rapidly as the demand develops, and in some cases anticipating requirements. One estimate indicates that of all new items for use of the chemical industries provided since the last exposition in 1947, more than 25 per cent are instruments.

To simplify analyses, metal treating industries are offered a new tube for monitoring combustion gas mixtures. The Viscotron, developed by Charles Engelhard, Inc., East Newark, New Jersey, plugs in like a radio valve and takes in gas through its base to activate a sensitive platinum element contained in a hard glass tube, by which signals are made to a recording instrument, a "Controlled Atmosphere Indicator." It is also useful as an explosion indicator and for maintaining combustion efficiency in ceramic kilns and coke ovens.

A new automatic fraction collector for use in the relatively new field of separation by chromatography was exhibited by the Technicon Chromatography Corporation, New York City. This will automatically collect any number (up to 200) of rigidly controlled samples of predetermined fluid volumes, controlled by a photo-electric cell.

Automatic Operation

The exposition demonstrated the continuing trend toward automatic operation. Among the newer applications the Brabender Corporation, Rochelle Park, New Jersey, included a recording plastograph, which uses the dynamometer principle to measure and record in graph form the plasticity or consistency of any material from light viscous substances to unvulcanised rubber; a recording viscograph, said to be the first of its kind made to heat and cool test material at a constant rate of temperature change (20° C. to 150° C.), graphing temperature and viscosity by means of a single chart line.

Two new instruments given their first public showing by the Perkin-Elmer Corporation, Glenbrook, Connecticut, were a newly developed universal monochromator and a double beam infra-red spectrophotometer. The former covers the ultraviolet, visible, and infra-red regions of the spectrum when suitable prisms or gratings are used. The optics are totally reflecting so that the instrument can be focused with visible light for use in ultraviolet or infra-red. The collimator is an 18° off-axis paraboloid of 270 mm. focal length, and the effective aperture of the Littrow mount is f/4.5. The prisms available are fused quartz, crystal quartz, glass, LiF, CaF_2, NaCl, KBr or KRS-S.

SULPHATE OF AMMONIA TOTALS

U.K. Production, Consumption and Exports

DURING 1948/49 world consumption of fertiliser nitrogen reached the record figure of about 3.5 million metric tons of nitrogen. In view of the growing recognition of the vital part played by nitrogen in the production of food, a considerable increase in fertiliser nitrogen capacity is now planned in many countries, states the 29th annual report of the British Sulphate of Ammonia Federation, Ltd.

The trend of world fertiliser consumption over the last 46 years has been one of continuous expansion, despite setbacks due to wars and economic crises. It has increased roughly 10 times since 1903.

Propaganda Work

The report recalls that 1948/49 (to June 30) was the 52nd year of propaganda work undertaken successively by the Sulphate of Ammonia Committee, the association, the federation, Nitram, Ltd., and Imperial Chemical Industries, Ltd.

The world total production of fixed nitrogen for all purposes in 1948/49 (expressed in thousands of metric tons) was 4152.1, against 3561.8 in 1947/48 and 3112.7 in 1938/39. World consumption figures were: 4084.4 in 1948/49, 3564.7 in 1947/48, and 3107.3 in 1939/39.

In view of the increased production available the International Emergency Food Council in Washington announced on April 19 that the system of international allocation of nitrogen fertilisers would cease to operate as at June 30 this year.

The figures in the table below show that the total home production of nitrogen products in 1948 was 17 per cent higher than in 1947 and 9 per cent over 1946. Fertiliser products increased by 16 per cent (7 per cent over 1946) and industrial products increased by 22 per cent (21 per cent over 1946). It will be recalled that 1947 was an exceptional year owing to the fuel shortage.

Agricultural consumption in the U.K. of sulphate of ammonia (tons of 2240 lb.) in 1948/49 was 593,779, against 632,916 in 1947/48. Home agricultural consumption of nitrogen (metric tons N) in 1948/49 was 185,104, against 185,410 in 1947/48.

During the year there has been increasing insistence by the Government upon the need for a larger total agricultural output and greater official emphasis on the part that fertilisers must play in achieving this end. Some disappointment has been expressed in ministerial circles on the failure of farmers to sow the wheat acreage required and special price inducements have since been offered in order to recover the lost ground. In fact, some 300,000 acres which should have been sown with cereals were left under or put back to grass and the total increase in grassland was 420,000 acres. These figures are significant as they account to a great extent for the reduction in demand for sulphate of ammonia for direct application.

Demand from Compounders

The open winter was also a factor in reducing the demand for direct application, as autumn sown crops were so forward and vigorous in the early part of the year that few farmers considered it advisable to use sulphate of ammonia for top dressing. The excessively dry period which followed was a further discouragement. This reduction was, however, offset by a further increase in the demand from the compounders, who again exceeded the previous year's record figure of production.

The Ministry of Agriculture, through the National Agricultural Advisory Service, has intensified the campaign for increased output from grassland and has achieved some success in substantially

U.K. PRODUCTION OF NITROGEN PRODUCTS AND OF AMMONIUM SULPHATE
(Tons of 2240 lb.)

Calendar Year	Total output of nitrogen products expressed as 25 per cent ammonia				Included in the total	
	England and Wales	Scotland	Northern Ireland	Total	Industrial Ammonia Products (expressed as 25 per cent ammonia	Sulphate of Ammonia as such (actual tons of product)
1939	783,400	72,400	1,000	856,800	263,900	483,300
1946	1,294,100	211,200	1,200	1,506,500	293,300	833,700
1947	1,244,900	162,000	1,700	1,408,600	291,200	796700
1948	1,438,100	209,300	1,400	1,648,800	355,100	901,000

increasing the amount of silage made during the year. Furthermore, the practice of grass drying is steadily increasing, both on a co-operative basis and with individual farmers. In order to achieve a large increase in output from grassland a great number of farmers throughout the country will have to raise their standard of management. Recognising this need the federation's agent, Imperial Chemical Industries, Ltd., has during the year continued preparations for an intensive and long-term development of this potentially large outlet for sulphate of ammonia.

The total shipments of sulphate of ammonia from the U.K. for 1948/49 and some previous years are shown separately in the full page table below. Up to June 30, these shipments were allocated by the Board of Trade in collaboration with the International Emergency Food Committee.

The following are the prices per ton to British farmers, delivered in 6-ton lots to buyers' nearest station, for neutral quality 30.6 per cent N. minimum:—

	1947/48 £ s. d.	1948/49 £ s. d.
Summer	9 11 0	9 16 0
Spring	10 8 0	10 8 0

(continued overleaf)

U.K. EXPORTS OF SULPHATE OF AMMONIA

To	U.K. Customs returns 1929/30	1936/37	1937/38	1938/39	1939/40	Actual shipment figures Fertiliser Years ended June 30 1943/44	1944/45	1945/46	1946/47	1947/48	1948/49
					(Tons of 2240 lbs.)						
Scandinavia ...	—	—	—	—	—	300	884	—	50	497	292
U.S.S.R.	20,285	—	—	—	—	—	—	—	—	—	—
Holland and Belgium ...	—	—	314	5	—	—	10,718	4,871	1,249	3,004	3,298
France	43	—	6,917	—	—	—	14,617	19,981	—	—	—
Portugal	7,711	11,797	19,520	19,428	2,079	—	9,828	—	—	6,708	4,580
Spain	194,205	18,717	9,576	5,842	3,846	—	—	—	—	5,580	2,923
Italy	4,878	—	—	—	—	—	4,444	—	—	—	—
Other Europe ...	22	333	361	499	306	509	4,178	9,918	735	606	633
Palestine/Israel ...	925	918	1,399	2,002	723	11,178	10,024	4,570	13,759	5,253	4,997
Other Levant ...	328	657	1,093	697	825	10	664	2,971	4,131	1,854	4,446
India, Pakistan and Burma	23,881	48,539	47,056	66,027	46,497	10,305	53,342	130,795	108,241	76,313	55,553
Ceylon	13,431	8,963	18,491	18,257	18,807	1,500	28,977	32,813	35,495	38,349	35,335
Malaya and British Borneo	2,625	20,647	32,479	23,880	17,662	—	—	782	18,467	3,209	13,653
Dutch East Indies	30,522	—	547	221	—	—	—	—	—	—	—
China and Hong Kong ...	109,888	36,726	41,194	33,761	—	—	—	1,105	7,607	4,970	9,729
Japanese Empire	158,971	541	—	—	—	—	—	—	—	—	—
Other Asia ...	19	601	703	1,078	533	—	—	—	1,413	449	500
Madeira	1,204	1,177	1,098	1,282	116	—	—	—	—	—	—
Canaries	19,464	9,494	10,776	12,392	176	—	—	—	—	2,923	5,466
Egypt	1,751	363	255	2,428	1,960	13,822	28,323	8,708	683	3,440	2,450
Sudan	2,649	2,072	2,075	2,856	1,116	—	—	7	—	17	15
West Africa ...	3	180	152	61	11	22	1,057	883	126	496	1,369
East Africa ...	157	886	1,503	1,112	758	6	941	815	1,296	1,343	2,559
South Africa and Rhodesia ...	1,986	8,964	15,186	16,818	15,635	—	8,013	2,581	6,149	5,336	6,588
Mauritius	6,688	14,031	11,900	10,258	15,875	—	6,471	—	2,500	11,500	10,631
Other Africa ...	14	—	—	5	—	—	852	499	228	320	300
Australia and New Guinea ...	9,960	22,141	26,719	35,552	27,841	—	1,960	23,368	17,549	14,245	7,787
New Zealand ...	10,123	5,743	5,540	4,860	3,348	1,218	—	—	—	—	—
Fiji Isles	1,919	3,389	2,575	4,011	3,791	—	100	1,250	1,910	2,085	2,669
Canada and Newfoundland ...	10	110	—	149	—	—	—	—	—	—	—
U.S.A.	—	—	—	—	—	—	—	50	642	—	—
Central America ...	—	2	—	8	—	14	—	—	5	—	75
British West Indies	3,745	15,672	19,911	15,550	22,722	14,998	12,294	14,454	12,535	17,409	29,356
British Guiana ...	5,830	9,854	9,860	11,043	14,339	6,161	6,634	12,079	7,211	9,652	12,639
Peru	533	1,079	1,183	1,032	497	—	—	—	—	—	—
Other South America ...	635	327	66	147	51	—	—	40	105	2	142
Total ...	634,405	243,923	288,449	291,261	199,514	60,043	204,321	272,540	242,086	215,560	217,985
Channel Islands ...	1,304	1,422	1,548	1,678	—	—	—	338	1,309	981	706
Eire	19,264	22,780	27,469	28,929	38,213	640	2,129	1,711	4,406	24,057	25,281
Total Exported	654,973	268,125	317,466	321,868	237,727	60,683	206,450	274,589	247,801	240,598	243,972

Plastics for Packaging

Likely Growth of U.K. Industry

THE probability that plastics as packaging materials would, before long, have an important influence in Britain's export trade was stressed by Dr. Harry Barron in a paper delivered recently in London to the Institute of Packaging.

"It is probable," said Dr. Barron, "that packaging is the largest individual consuming outlet for plastics in U.S.A. About 150,000 tons, or roughly 20 per cent of total output is used for packaging, a very large part being absorbed by thermoplastic films, or as treatment for papers. And this usage is actually considered to be in its infancy."

In Britain, he said, the consumption of such plastics in the packaging field was quite small—a minute fraction of the American consumption. But since, in most industries, we tended ultimately to attain a relationship to the U.S. volume, often about one-sixth, it was evident that the potential future of plastics in packaging was very great.

The more important materials now in use in the U.S.A. were: Cellulose plastics, cellulose acetate, cellulose acetobutyrate, and ethyl cellulose. Vinyl plastics: polyvinyl chloride, polyvinyl copolymers, polyvinyl chloride-acetonitrile, polyvinylidene chloride, polystyrene, polyvinyl acetals and polyethylene; polyamide (nylon) plastics and rubber hydrochloride. The only types commercially available in the U.K. were cellulose acetate, polyvinyl chloride, polyethylene, and rubber hydrochloride.

An outstanding application of polyethylene in the packaging field had been the evolution of the unbreakable plastic bottle. Production in the U.S.A. was already on a very large scale, 23 million having been produced in the past two years. The cost was about 2½ times that of glass, but the Americans had been insatiable. Production had now started in the U.K.

This served as an example of the importance of using plastic films when packing for sale in export markets where competition was severe, such as in the U.S.A. When overseas buyers had become accustomed to a certain type of packaging, they tended to reject the same class of goods packed in another manner.

Dr. Barron pointed out that, when trying to sell a South American buyer equipment he had been accustomed to receiving from U.S.A. packed in rubber hydrochloride or polyvinylidene chloride films, one might have greater difficulty in selling him the same type of equipment, unless one could provide a form of packaging at least as good.

Dr. Barron discussed each plastic film material in detail under the following headings: Physical properties, tensile strength, tear resistance, flexibility (down to low temperatures), heat sealing, water absorption, water-vapour permeability, solubility in solvents, resistance to oils and greases, heat and combustion, oxidation and mould growth, chemicals, gas transmission, and area of film obtained per lb. of material (an important factor in determining cost).

SULPHATE OF AMMONIA TOTALS

(continued from previous page)

Since 1934/35 summer prices have been increased by 1s. 6d. a ton per month up to the spring price. Since 1940/41 prices to farmers have been "pegged" and producers have received a subsidy on home agricultural sales to cover increases in cost not included in the price. Prices were increased by 1s. per ton from July, 1946, and a further 5s. per ton from October 1947, to cover increases in railway freight rates.

The following are the final average prices to members per ton produced, based on sales realisations for all deliveries, home and export, free on rail at makers' works in secondhand bags, after making allowance for adjustments in the value of unsold stocks and provision against losses in certain markets:—

	For 20.4 per cent Nitrogen Ordinary Quality	For 21.1 per cent Nitrogen Neutral Quality
1924/25	10 18 0	12 5 6
1930/31	3 10 7	4 12 10
1938/39	4 19 11	5 10 11
1943/44	7 17 5	8 10 1
1944/45	8 13 1	9 5 9
1945/46	9 1 11	9 14 7
1946/47	9 8 4	10 1 0
1947/48	9 16 4	10 9 0
1948/49	10 6 6	10 19 2

On June 30, 1949, the federation comprised 79 members, including the National Coal Board, which represents 28 individual undertakings included in the total of 106 members as at June 30, 1948. There have been no withdrawals.

MINERAL SOURCES OF FLUORESCENCE

Preparation and Application of Organic Salts

THE scientific basis of the industry of fluorescent salts, and the manufacture of mineral and organic salts employed, were described in a paper delivered by Dr. J. Heubel, of the Sorbonne, at the conference in Paris of the Centre de Perfectionnement (*Chim. et Ind.*, 1949, *62*, 461-465).

French contributions in this field were of fundamental importance, particularly the introduction of stable substances into an electrical discharge tube in 1935 by André Claude and his fellow workers (Etab. Claude, Paz et Silva). It was then possible for the first time to obtain several thousand hours' lighting without diminution in intensity.

Mineral salts are the most generally used at present, but the organic salts, more numerous and varied and also more fragile, are of considerable scientific interest and have certain limited applications. Among the mineral salts are sulphides, silicates, tungstates, molybdates, alkaline earth oxides, etc., and also more especially the halo-phosphates of the type $Ca_5(PO_4)_2$, $Ca(Cl,F)$.

Zinc-Cadmium Sulphides

The most commonly used sulphides are those of zinc and zinc-cadmium which have a definite fluorescence when roasted. Activators employed in this connection are silver or copper, of which only a mere trace is needed (0.001-0.0001 per cent). Maximum emission, however, is obtained by the use of manganese in much larger proportions, up to a few units per cent. The maximum, 5800 A, is constant whatever the proportion of cadmium sulphide.

Alkaline earth sulphides or mixtures of sulphides and sulphates which can be activated by several metallic elements, have also been proposed. The calcium sulphide and sulphate may be obtained either by directly reacting lime and sulphur, or by passing carbon disulphide vapour at high temperature over a mixture of sulphate and oxide in an inert atmosphere; in both cases the luminescent agent must be added before the reaction.

It has been found that strontium sulphide activated with bismuth gives the best results. But in general practice the silicates are preferred owing to their greater stability; they are usually activated with manganese, and excited by X-rays or other source. Among the most commonly used are willemite (o-silicate of zinc) or cadmium silicate.

The preparation of these salts requires considerable care, as all depends on purity, judicious mixture, and mode of preparation. Until recently it was necessary to use a mixture to obtain white light, but from research of MacKeag and Randy this can now be achieved with a single substance, namely, the halo-phosphates, which may be activated by any one of several agents.

Patented Processes

The use of these salts has been developed in England; and the patents have been bought in the U.S.A. where large scale plans are in progress. In France, too, it is expected that they will very soon be available.

Among impurities which must be specially avoided is iron which even when present as a trace (10^{-3}) may reduce the fluorescence; in the case of calcium tungstate it is as much as 17 per cent. Spectrographic control of analysis is indispensable; air must be strictly conditioned; and iron parts in plant avoided. Grinding and mixing of constituents are done in porcelain mills, and the product heated to about 1200°C., in either an inert or reducing atmosphere. Attempts are being made to improve the process with lower temperatures.

Solutions of salts are first prepared, *e.g.*, of zinc or cadmium nitrate, or zinc sulphate, and these are purified by electrolysis and fractional crystallisation. Intermediate products—oxides, carbonates, etc.—are precipitated by ammonium carbonate, hydrogen sulphide or hydrochloric acid. These purifying refinements may be avoided if sufficiently pure raw materials are available.

Manufacturing Precautions

Various precautions are indicated in the preparation of zinc sulphide, tungstates, etc., and silicates; and operation of the luminescent tubes is briefly described.

The organic salts are more varied, more delicate, and less extensively used. Their principal field at present is in research, publicity, and in the decorative and theatrical arts; but further possibilities are very extensive and important. Their

luminosity is more complex than that of the inorganic or mineral salts, and among its principal governing factors are: solvent used, concentration, and adsorption on solids.

In the aliphatic group the aldehydes and ketones yield the most intense luminescence, and the carbonyl section is also of considerable interest. Most of the benzene derivatives in the aromatic group are fluorescent, as also many of the compounds of cyclohexagonal structure, whether homo- or hetero-geneous.

Organic Salts

While the methyl, amide, hydroxyl groups and the cyanide and non-saturated radicals increase the fluorescence, the acid or nitro groups have the opposite effect. A large number of these organic salts have been prepared for fluorescent work.

Among the present applications of fluorescent salts, luminescent paints probably come first, their use being widely extended during the war. They are usually prepared by incorporating in a suitable vehicle—varnish or oil—an organic luminescent material to the extent of about 0.15 per cent by weight, and it should, of course, be inert to the vehicle.

If the paint is applied to a substratum this should have good reflective power for ultra-violet rays. According to Luckiesh and Holladay the best results are obtained with pigments of MgO, MgB_2O_5, or Al_2O_3 base, or a mixture of Zn and Ti oxides. Cellulose varnishes are the best transparent media, while for opaques ZnS can be employed. White luminescence may be obtained with a mixture of rhodamine, primuline, and auramine.

Textile and Plastic Uses

Other uses are in connection with textiles, as Francolor, with plastics, and other material. Brilliant effects have been achieved in the theatrical field, as in the play "Soulier de Satin" at the Theatre-Français, and more recently in "L'Auberge du Cheval Blanc" at the Châtelet. An interesting new application by M. Deribère in France is in the examination of engravings that have become old or worn, and in the investigation of surface states as to roughness, etc.

Yet another promising field is that of analysis, both quantitative and qualitative, in *p*H fluorescent indicators, in various physical data evaluation, histologic specimen examination, etc.

Present consumption of these materials in France, where the demand is much in excess of supplies, may be reckoned at 1-2 tons only. About 85 per cent of this is for general lighting or photo-luminescence, as in television screens. About 300 km. of tubes are produced per annum, and this is increasing.

The industry in France is not, however, progressing as quickly as it might, possibly for two reasons: consumption is still too small in value to justify or require large developments in research or production; and there is still insufficient unity of action or co-operation.

Conditions are different in the U.S.A. and in some other countries, such as England and Holland. In Italy it is in its initial stages; in Russia, Hungary, and Czechoslovakia it is limited mainly to cathode tubes for control instruments. There are great potentialities and further research with a view to reduction of costs and increase in efficiency and stability should give satisfactory results.

ITALIAN ALUMINIUM PROSPECTS

MUCH has been said and written concerning the possibilities of aluminium industry in Italy after the loss of Istrian mines. It is certain that the other sources of bauxite Italy has at its disposal are by no means as rich as the ones now held by Yugoslavia. At the same time, statistics show that, not only is the production of aluminium in Italy now sufficient for home needs, but Italy exported in 1948 various aluminium products equivalent to 22,105 tons of metal, some 10 per cent more than in 1938.

The possibilities of Italy, however, are not yet exhausted in this field. There are plenty of beds of lower grade material near Civita Castellana, Lake Braccione, Sessa Aurunca, Roccamonfina, Gargano and Abruzzi.

Italian technicians are planning to supply the raw material to countries such as Germany, Sweden, Norway, and Switzerland, whose bauxite resources are insufficient but whose equipment and supplies of electric power could make economical use of the poorer types of Italian material.

There are also several schemes to exploit the beds of Civita Castellana and Bracciano on the spot. The cost of the plants needed is heavy, but recent studies made in this direction are encouraging, especially as the methods evolved promise also a good yield in potassium salts.

MECHANISM OF HOMOGENEOUS PYROLYSIS

Franco-Belgian Progress in a Fundamental Research

PYROLYSIS in the gaseous phase of organic substances is of importance from two points of view: (a) industrial, as in the cracking process, and (b) scientific, in the study of the mechanism of chemical reaction. It is a wide and ever-broadening field of profound interest, and part of it has been recently surveyed by Michel Niclause, of the Faculty of Sciences, at Nancy, in a paper presented to the Société Chimique de Belgique (*Ind. Chim. Belge.*, 1949, *14* (3), 71-80).

An introduction covers some of the pioneer work of Hinshelwood and others, and the experiments which supported the hypothesis of an initial decomposition of the molecule into free radicals. An attempt is made to trace the ultimate fate of these radicals, the further reactions, and the final products. The theory of chain mechanism is also considered.

The various well known methods of detecting free radicals and atoms are briefly described, such as mirrors, induced reactions, *p*-hydrogen and mass spectrometry.

On the subject of chain mechanism the earlier work of Rice and Herzfeld is reviewed, as well as the recent attempt of Goldfinger, Letort and Niclause to generalise the kinetic systems proposed by Rice and Herzfeld, and evolve general laws combining mechanism and order. (V. Henri Memorial Volume, Liège, 1947-8, pp. 283-296).

Types of Radicals

In this last named work the authors mentioned consider it necessary to distinguish two types of radicals: (1) those which react only in contact with another group or entity (particule) and may be called β radicals to denote their bi-particulate nature; (2) those which will most likely spontaneously decompose, are thus mono-particulate, or μ radicals.

The two cases are considered in forms in which one or the other or both of these types of radicals take part; and in each case the possibility of ruptures by triple collision with a molecule M of the initial product has also been considered, as well as that of a bimolecular initiation.

Some results are tabulated.

The theory of chain mechanisms enables the total activation energy of homogeneous pyrolyses to be determined from the probable values applicable to elementary processes. This is exemplified in the case of acetaldehyde. Inhibitions and inductions are discussed, the former with reference to the nitro group and to propylene (Hinshelwood *et al.*), and the latter from the point of view of the effect of traces of oxygen (Letort, *Comptes Rendus*, 1938, *197*, 1942).

Hinshelwood's views on partial induction by NO are criticised as somewhat arbitrary. Contrary to that author's hypothesis, it is now suggested that the maximum inhibition by the NO group by no means corresponds with the complete elimination of the chains. The fact that small amounts of NO inhibit, and large amounts accelerate numerous pyrolytic reactions seems rather to indicate that two antagonistic phenomena are involved: the one inhibitive in some directions, and the second accelerative in others. This has been suggested by Gol'danskii (*Upsekhi Kim.*, 1946, *15*, 63; *Chem. Abs.*, U.S., 1946, 69557). At all events it appears that the present experimental results may be interpreted without recourse to a dual mechanism hypothesis.

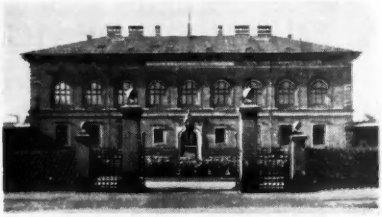
Chain Mechanisms

It has been shown that the theory of chain mechanisms through free radicals helps to explain a series of experimental facts, *e.g.*, noted in the homogeneous pyrolysis of certain organic substances, such as saturated hydrocarbons, aldehydes (except formaldehyde) and ethers: (a) detection of free radicals in normal pyrolysis, and (b) induced decomposition.

It would be premature, however, to deduce a free radical chain mechanism in normal pyrolysis in these substances just mentioned as a universal rule. Account must be taken of the existence of other substances—toluene, ethyl bromide, etc.—in which free radicals can be observed but not necessarily also an induced decomposition. It may indeed be generally concluded in such cases that, although free radicals are present, pyrolysis does not involve a chain mechanism. In other words, the formation of free radicals in the primary reaction stages is a necessary condition but by no means necessarily involves chain reactions. In other cases again it may be necessary to invoke direct intra-molecular action (Rice and Teller, *J. Chem. Phys.*, 1938, *6*, 489; and C. C. Coffin, *Can. J. Res.*, 1931-1940).

The CARLSBERG LABORATORY

by J. GRINDROD



The laboratory was founded in 1875

BUILT and equipped by the founder of the famous Carlsberg Brewery, near Copenhagen, in recognition of the practical help science had been to him, the Carlsberg Laboratory is one of the finest scientific institutions in the world. It is financed out of the profits of the business and is controlled by the Carlsberg Foundation, which, in turn, is managed by five professors chosen by and from the members of the Royal Danish Academy of Science.

When framing the statutes of the laboratory, its founder, J. C. Jacobsen, laid it down that " no result of the activities of the institution, whether of a theoretical or a practical nature, shall be kept secret " and the world has benefited greatly by the knowledge which has come from this source.

The laboratory's chemistry department, although devoted to research in general, has naturally worked principally along lines parallel with the industry with which it is so closely connected. For instance, its first head, Prof. J. Kjeldahl, discovered the Kjeldahl method for the determination of nitrogen. Emil Christian Hansen conducted researches in fungi and alcoholic fermenting yeasts. He was able to prove that there were different species of yeast and that they may be cultivated from a single cell. His method was based on Pasteur's experiments and the world's first pure-cultivation apparatus is still in use at the Carlsberg Brewery.

Deep Fermentation

Fermentation, which was once very largely a matter of chance, was brought under control by the use of yeast cultivated under sterile conditions. The yeast grown from single cells is now largely used in the deep-fermentation breweries of the Continent.

At the Carlsberg Brewery fermentation cellars hold the equivalent of 25,000 barrels of beer in vats, of which the largest is equivalent to 672 barrels. Cooled sterile air is blown in under the white vaulted roof. The fermenting beer is kept at a temperature of 7-9°C. (44-48°F.) and is regulated by direct refrigeration in the vats.

A later director of the chemical department, Prof. S. Sorensen, was responsible for the modern technique of measuring hydrogen-ion concentration and conducted much research into the chemistry of proteins.

Micro-Chemistry

Sorensen was succeeded by Dr. K. Linderstrom-Lang, a brilliant scientist, who is the present head of the department. He has pursued the problems of the processes of fermentation and the chemistry of proteins, and he has particularly concerned himself with identifying and measuring the very minute chemical changes that occur in living organisms. He has brought his training as a physical chemist to bear on the technique of micro-chemistry, especially in detecting and measuring the reactions that take place when small quantities of substances, say proteins, are made to ferment.

To this end, he, with Dr. Heinz Holter, his collaborator and friend, has extensively used the principle of the Cartesian diver and its action under varying densities. As a result of their investigations the use of this instrument has been rendered a matter of great precision, and their work during the war years has been the subject of a treatise, in which Linderstrom-Lang has analysed the theory of the diver and Holter has described the technique of its design and how its use with maximum precision and accuracy has been achieved.

Within a very small range, the size of the divers has varied considerably. Their length has been anything between 10 and 20 mm., the cross-section of their necks 0.3 to 1 sq. mm., and volume from 3 to 20 cu. mm.

One of the first divers used by Linder-

strom-Lang consisted of a glass bulb which held about 10 cu. mm. of gas, which floated in the bottle with the open tube upwards. A drop of oil, used in the neck to act as a sliding stopper, rose or fell according to the pressure outside the bulb. On the top of the oil drop was an air bubble and this contacted the liquid pressing down the open neck.

Index of Gas Evolved

Into the bulb containing the gas was dropped a very small quantity (say about 1 cu. mm.) of a mixture of protein and ferment, by which a gas-producing reaction was set up. The increased volume of gas raised the oil stopper and some of the liquid beyond the air bubble was ejected from the neck of the bulb. In these circumstances the lighter bulb would be expected to rise, but, by exerting pressure inside the bottle, the bulb was maintained at its original level. Thus the amount of gas produced by fermentation was related directly to the amount of pressure required to maintain the bulb at its marked position.

This type of apparatus was later used for other purposes, such as the measurement of respiration changes in living tissues. Many difficulties and pitfalls were encountered, such as the diffusion of the gas (especially the soluble carbon dioxide) through the oil drop, but most of these were overcome by alternative technique, such as the insertion of loose hollow glass stoppers either inside the drop of oil or inside the fluid pressing into the neck of the bulb.

Many types of liquid have been used but the most effective appears to be a solution of sodium carbonate and sodium chloride containing a small percentage of sodium taurocolate, the latter improving the fluidity of the mixture.

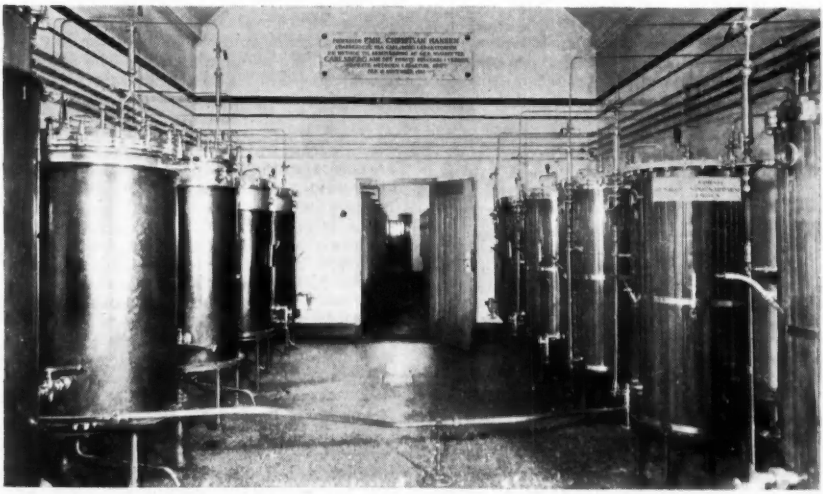
Although operational errors have occurred, results with Cartesian divers are now so fine that their behaviour has been reduced to mathematical equations; detailed instructions for procedure have been tabluated by Holter.

The apparatus is simple and cheap, can easily be replaced and is quickly erected and dismantled.

Among other methods for studying and measuring changes in proteins being used by Linderstrom-Lang, one is based upon the regular diffusion of two fluids of varying density. If, in a vertical column of liquid, a soluble substance is introduced at one end, it begins to diffuse steadily toward the other.

In the same way, if the upper and lower halves of the tube are filled with different fluids, one of which is soluble in the other, then again, regular diffusion takes place. So stable is this diffusion that the tube

(continued overleaf)



Pure-cultivation vats at Carlsberg, including (right) the world's first pure yeast cultivation apparatus, installed in 1883, and still in use to-day

Chemical Properties of Propiophenone

Widening Range of Industrial Applications

THIS alkyl aryl ketone, propiophenone, which is finding widening use in the production of pharmaceuticals, possesses many of the chemical properties of acetophenone. It is a water white to amber liquid having a melting point of 21° C., boiling point of 218° C., and 760 mm. mercury and freezing point (minimum) 17.5° C. The flash point (tag open cup) is 99° C. and (tag closed cup) 88° C.

Propiophenone is essentially insoluble in water, ethylene glycol and glycerine, but miscible with ethyl alcohol, ethyl ether, benzene and toluene. The pharmacological action of this chemical is qualitatively similar to acetophenone, the principal action being a rather deep narcosis or coma. The lethal dose for dogs has been found to be 2.5 grams per kilo. of body weight.

THE CARLSBERG LABORATORY

(*continued from previous page*)

may be microscopically graduated for density to an accuracy of three parts in a million.

It will be seen that, if a diver containing a ferment or enzyme is used in conjunction with the vertical fluid column of graded varying density, the extent and even the rate of reaction can be accurately measured. Instead of a diver a drop of liquid (containing the reactionary substance) which does not mix with the liquids in the column may be used.

As well as a department for chemistry the laboratory maintains a physiological department, which has also worked on the properties of yeast. One of the noteworthy results of that was the revelation by Prof. O. Winge of the sexual processes in this fascinating substance.

In 1943 a new department of cytochemistry was formed under the direction of Dr. Holter.

The Carlsberg institution is thus, in every way, an expression of reciprocal action between industry and science and as such it is almost unique. Although Carlsberg is first and foremost a national institution, its reputation and influence is world-wide. Through the entrance hall of the laboratory, which contains the busts of Pasteur and Liebig, have passed many of the world's distinguished scientists, to learn or to collaborate in this impartial enterprise.

The most important use for propiophenone appears to be in the synthesis of pharmaceuticals, *e.g.*, the production of ephedrine, an amine with pharmacological properties similar to, but differing in degree from, epinephrine (adrenalin).

In the synthesis of ephedrine the first step is the production of the halogen substituted ketone, alpha-bromopropiophenone. This is reacted with methyl amine to give a reaction product, which, after reduction of the ketone group to a carbinol group, yields a mixture of the isomers of ephedrine from which the pharmaceutical preparation can be separated. This is one of the several methods which are now in use.

The related compound, nor-ephedrine, also known as Propadrine NNR, is synthesised from propiophenone by first reacting it with methyl nitrite or butyl nitrite to give isonitrosopropiophenone. This can be hydrogenated to yield Propadrine.

Anti-malarials, such as the hydroxycinnolines have also been made from propiophenone via ortho-aminopropiophenone. Propiophenone is used as a base in compounding perfumes, finding particular value in those simulating such odours as hawthorn, mimosa and new-mown hay. The nitro-propiophenones have very pleasant odours and are assuming growing importance.

Nitration

Nitration of propiophenone with concentrated nitric acid yields a mixture of nitro- and meta-isomers. When the nitration is carried out with fuming nitric acid, a small yield of the para-isomer is obtained. The nitro-propiophenones can be reduced to the corresponding amino-propiophenones. The meta-aminopropiophenones can be converted to meta-propylphenol, or to meta-propyl-anisole, which has a flavour very similar to liquorice.

Some of the condensation products of propiophenone with aldehydes and ketones are of a resinous nature and of interest for use in lacquer and coating formulations, and also as plasticisers. Propiophenone also condenses with itself to form a substituted trioxane, which is reported to be unaffected by alkaline or acid solutions, oxidising agents or by alkali fusion.

SAFETY DRIVE IN BELGIAN CHEMISTRY

Accident Frequency was Reduced 75 Per Cent

BELGIAN experience in the drive to minimise accidents in chemical works, which has been summarised in a contribution at the Fondation Universitaire, Brussels, by Dr. A. de Gheldere, bears witness to the excellent results which can be attained by close and vigorous collaboration, even by a relatively small group. Dr. de Gheldere described the safety and hygiene work, and results, of the Union Chimique Belge, of which he is a director.

Belgian chemical industries, he recalled, had become alarmed, in 1938, at the rising curve of industrial accidents and had determined to undertake a long and vigorous security campaign.

The Union is a group of about 12 chemical companies and several laboratories, employing 5000, as well as 1300 chemists and executives. In 1938 a Service de Securité was established, comprising in the first place a safety engineer in each factory, assisted by a number of Agents de Securité, all under the control of a central council at headquarters.

A Government department is engaged in very similar work—Comités de Securité-Hygiène et Embellissement des Lieux de Travail—created by a decree of December 1946. The functions of the Union organisation are complementary to the official ones and, during the past 10 years, says Dr. de Gheldere, have gone far beyond the official level of minimum safeguards.

Technical and Human Causes

Their work is concerned with two main aspects: technical causes of accidents, and human causes—psychological or physiological. The former is sub-divided into collective and individual causes and preventives. A voluminous literature, based on long experience, has been compiled and placed at the disposal of the Association des Industriels de Belgique. The various preventive measures are described, and colour schemes are amply illustrated.

Works are periodically inspected by experts of the AIB. Among the safety literature which is distributed is the *Bulletin de Securité-Hygiène* of the Union Chimique Belge, issued quarterly, in French and Flemish editions. A bronze and marble trophy is presented annually to the works that shows the largest reduction of accident rate compared with the previous three years—not necessarily the works with the lowest accident rate. A novel characteristic of this campaign is the establishment in many of the factories of "museums," in which are displayed collections of miscellaneous articles, etc., which have constituted sources of accident, such as defective tools, inefficient insulations, etc.

Accident Rate

Some of the results of the security campaign are recorded. In 1937 the accident rate—or frequency expressed as the number of accidents per million hours of work—was 80, an alarmingly high figure. In 1939 the rate had fallen to 35.6. During the war it rose to 54.9. In 1944-45 it fell again to the pre-war level. In the great activity of 1946, with many new and untrained workers, the rate rose slightly to 37. By 1948 it was only 19.3—a remarkable achievement.[1] These figures relate only to works of the UCB.

Official figures, for comparison with Belgian industry generally, are not up to date, extending only up to 1943. Accident rates for (a) chemical industry generally, and (b) all industry during 1941-3 were as follows:—

	(a)	(b)
1941	50	82
1942	65	90
1943	60	95

The corresponding figure for some Belgian metallurgical works has been as high as 400.

In England, of which some data are given in the Belgian paper (taken from the *Industrial Accident Prevention Bulletin*), the rate in chemical industry represented by 189 members, ranges from 0 to 86, the average being 21.9. In the U.S.A., according to the National Safety Council, the frequency rate has fallen 70 per cent between 1930 and 1947. In France, according to the *Bull. de l'Assocn. des Industriels de France*, the average rate in the chemical industry in 1947 was 103.

[1] Since the paper was read, figures for 1949 have become available from the UCB:—
1st qtr. 16.9 : 2nd qtr. 17.1 : 3rd qtr. 13.5

Blast Furnace Explosions

Men ran to safety when four explosions occurred at an iron and steel works near Rotherham recently. No one was hurt, and repairs were expected to take only a few days.

Some Characteristics of French Kieselguhr

Parallels with Diatomite

From a FRENCH CORRESPONDENT

FRENCH experience in developing uses of indigenous kieselguhr derive interest from the number of points of similarity with the current exploitations of diatomite deposits in the Island of Skye.

In part of Touraine—the valley of the Cher and Indre rivers—where kieselguhr is extracted, the cretacious formation constitutes the major part of the soil. The upper layer is composed of fine powdery silica (Langé), which is used in pottery. Its origin was considered purely chemical as it was believed to be derived from the alteration of silex (which is abundant in the area) and no trace of infusoria was found on microscopic examination.

Radiolarites

More thorough study has, however, contradicted this belief. If certain powdery varieties of silica have undoubtedly a chemical origin others are without doubt formed by the skeletal remains of radiolaries, miscroscopic animalculæ of the Rhizopod family. This agglomeration of organic fragments should correctly be called radiolarites. Their chemical composition is exactly the same as that of diatoms; only the form of the siliceous particles is different, and that does not affect many applications. In the case of radiolarites, the form is globular, not flat or radial.

The chemical composition, expressed as percentages by bulk, of some of the better known radiolarites and diatomites is given below :—

	Radiolarites		Diatomites	
	Langé	Baudres	Algeria	Germany
Silica SiO_2 ...	89.20	91.40	81.80	85.40
Alumin Al_2O_3 ...	5.30	3.60	2.70	2.20
Ferric oxide Fe_2O_3	1.80	1.40	1.20	2.97
Titan oxide TiO_2	0.20	0.20	—	—
Lime CaO ...	0.70	0.70	3.00	0.70
Magnesia MgO ...	0.60	0.60	0.20	0.50
Loss on heating	2.20	2.10	10.50	9.10

The small content of lime, which is constant in Touraine silica, gives the latter a marked superiority in certain uses, most silica varieties being used in very fine powder form.

Practically, whether for insulation, construction, filtration or manufacture of polishing products, no difference need be made between the product of radiolaries and that formed by diatoms.

In the Mesnes quarries at Baudres (Indre Department) the kieselguhr layer crops out and is covered by only a thin layer of vegetal soil. Its total thickness is from 10-15 metres. Within the layer there are strata of kieselguhr 1 to 1.50 m. thick and separated by beds of silex cobbles, and sometimes by clay veins which must be carefully removed after extraction. The stratification is very regular and mostly horizontal.

If extracted fresh, kieselguhr earth is very damp, even during the hottest weather. On an average, it requires the removal of a water content of 25 to 40 per cent before crushing; this is done in special ovens or in ventilated shelters, after compressing the earth into bricks. The latter drying method is preferable, as there is no risk of changing the composition by temperature increase.

In the Cavaliers Works, near Chateauroux, which is one of the best equipped factories in the area, the bolting of kieselguhr is done with sieves of up to 300 mesh, and even smaller for special qualities. The production figure of the Indre quarries is estimated at approximately 10,000 metric tons a year. This could be considerably increased.

Pharmacognosy Recognition Sets

TO cater for the regular demand for specimens of crude drugs, Evans Medical Supplies, Ltd., has prepared a standard set containing a sample of nearly every crude drug—nearly 90—listed in the syllabus for the qualifying examination of the Pharmaceutical Society of Great Britain. Exceptions are those drugs covered by D.D. Regulations, essential and fixed oils, and a few that are at present unobtainable. Each specimen is supplied in a container, the label of which gives the official name, natural origin, family and geographical source. Only a limited number of the Pharmacognosy Recognition sets will be available owing to the amount of labour required to select and pack the specimens. A set is, however, being presented to each of the colleges recognised by the Pharmaceutical Society. The sets will be supplied to others at a nominal price of £2 2s.

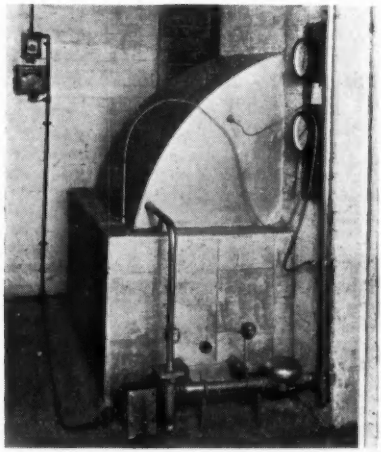
VERMICULITE

Flexible Means of Insulation

THE obvious potentialities of vermiculite as a highly effective and relatively cheap insulating material find a practical application in the form of a new insulating brick, compounded of sand, ciment fondu and vermiculite. The patent for this brick, rectangular and tongued and grooved, has been taken out by a Wolverhampton firm (Reymor Brick Co., Ltd.) in collaboration with a gas engineer and is stated to have resulted, in its first uses, in heat conservation represented by fuel savings of up to 30 per cent.

Next to their marked insulating capacity, the chief merit of the new bricks is the ease with which they may be installed, by unskilled labour and without cement or mortar, or removed. The benefit of this is evident, in view of the need to preserve the accessibility of the kind of equipment for which they are chiefly required, heated solution tanks and the like. The loss of heat from such vessels, whether heated by gas burners or steam pipes, is a common phenomenon. Enveloping such tanks in ordinary brickwork has conspicuous disadvantages.

The bricks are soft enough to be cut or sawn with ease, yet tough enough to stand rough treatment. When assembled round a heated tank, holes can easily be cut to admit gas pipes, injectors or other fittings, and to provide secondary air inlets and flue outlets. Special bricks are provided for corners, called long angle bricks and short angle bricks. These comprise two



A practical example in an oil plant

integral parts extending at right angles to each other, one part having a groove in its outer edge and the other a tongue, to key with the tongues and grooves of the bricks in the walls.

Long and short cover bricks are provided to finish off the upper edges of the side walls, and to meet the surface of the tank to close in the combustion space. These covering members are stepped to fit flush on to the bricks in the top course, and they are rounded on one upper edge to provide a neat finish. Some of the cover bricks are supplied mitred for use at corners.

Steam Control and Production Costs

A NEW 20-pp. booklet, *Steam Economy*, will be of interest to a large number of firms using steam for process and heating. It offers suggestions for improving the output economy of steam-heated plant.

At the beginning of the war, before the fuel efficiency campaign began, Spirex Manufacturing Co., Ltd., of Cheltenham, published its Bulletin No. 9 on "Fuel Economy," which was the forerunner of many publications on the subject as the campaign developed. Two years ago a further bulletin—No. 16, *Steam Economy*—made its appearance, of which the present issue is the latest revised edition. It is concise and eminently readable, with easy-to-follow diagrams. It confines itself to the simple ways in which users can get more value from their steam consumption, and the suggestions can, it is claimed, be commonly applied to all steam units.

Prominence is given to the need for more accurate measurement of steam consumption as a fundamental requirement of the costing system. This, states the company, is at the very root of production costs and economy. Attention is drawn to the value of an indicating steam meter on the steam supply to each main department, as well as at the boiler mains.

Emphasis is given to the new technique of "individual steam separation" (a small steam separator in front of each process unit) as an important element of efficient heat transfer methods.

Technical Publications

PROCEDURE for obtaining supplies and for effecting imports and exports of those materials for which the Board of Trade and Ministry of Supply are responsible, is contained in the new edition of the "Raw Materials Guide," November, 1949 (HMSO, 1s. 6d.), now available. The present Guide includes all the various alterations made since the beginning of February, 1948, and gives details of the relevant statutory orders or instruments in force at July 31, 1949. Alterations up to September 30, 1949, are included as addenda at the back of the volume. There is much useful information as to the nature, origin, and uses of the materials covered.

* * *

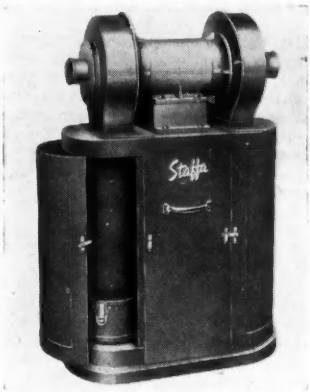
LATEST developments in precision electrical instruments are notified by Muirhead & Co., Ltd. Beckenham, Kent, by the issue, at frequent intervals, of a series of bulletins, of which three now available describe the Duddell type oscillograph employing an oil-damped bifilar suspension (B.641-A); inductance bridge giving the inductance in terms of an external capacitor standard (B.644-A); and a frequency bridge with variable dial (B.645-A).

* * *

A REPORT on investigations into a corrosion-resisting cast chromium-nickel steel, carried out in its metallurgical laboratory, forms the main article of the "Sulzer Technical Review" (No. 2), just published by Sulzer Bros. (London), Ltd. Other features cover diesel engines, pneumatic conveyors for the tobacco industry, and a general account (with drawings and photographs) of discharge regulation in piston-type compressors, and the suction valve regulating system developed by the company.

* * *

THE possibility of measuring microbiological degradation of cotton is experimentally demonstrated and a technique for assessing damage caused to cotton yarns by fungi under laboratory conditions is described in report No. 11, of the Selected Government Research Reports on "Textiles and their Testing," Vol. 4, now obtainable (HMSO, 6s. 5d., post paid). The volume contains 12 reports, six of which are devoted to the testing of fabrics for resistance to tearing, breaking and peeling. The durability of metal-plated fabric and the fire-proofing of cotton fabrics are each the subject of two reports.



[Courtesy, Chamberlain Industries, Ltd.

The D.E.A twin portable dust extraction unit, a new design in this range of equipment, which employs two centrifugal suction paddle blade fans, powered by a totally enclosed, double spindle motor. It is suitable for attachment to existing grinding, polishing or buffing machines, etc. Provision is made for ducting to be readily connected to discharge the cleaned air to atmosphere outside the building

UNDER the revised title, "Water Pollution Abstracts," Nos. 1, 2, and 3 of Volume 22, prepared by the Water Pollution Research staff of the Department of Scientific and Industrial Research, have just been released. The abstracts, formerly entitled "Water Pollution Summary of Current Literature," are published monthly.

* * *

CHEMICAL accidents, their cause and prevention, form a section of a new pamphlet "Accidents, How They Happen and How to Prevent them," published for the factory Department, Ministry of Labour and National Service (HMSO, 9d.). Causes are divided into poisoning, fire, and explosion and typical examples are briefly cited relating to oxygen deficiency; housing of chemical plant containing toxic gases; handling of corrosive liquids; maintenance work on plant which has contained corrosive liquid; oxygen in confined spaces; soldering and cutting of oil and petrol drums; and sugar dust explosion.

LEAK DETECTION IN PNEUMATIC SYSTEMS

New Development Employs Tracer Gas

A TECHNIQUE which is new in this country has been evolved for the rapid and accurate location of leaks in aircraft and other pneumatic systems by the introduction of the type H leak detector, developed and manufactured by the British Thomson-Houston Co., Ltd., Rugby. With this, it is said, even the most complex systems can be tested with ease and certainty. The equipment should be of value to manufacturers of aircraft as well as to makers of all types of pneumatic equipment for aircraft and other purposes, and to all sections of the industry concerned with the maintenance of such systems.

The method employed in testing is to inject a small quantity of suitable "tracer gas" into the air or gas in the system; any air escaping will then carry a small percentage of tracer gas with it. The leak detector is highly sensitive to the presence of the tracer gas and any leak, however small, can be readily detected.

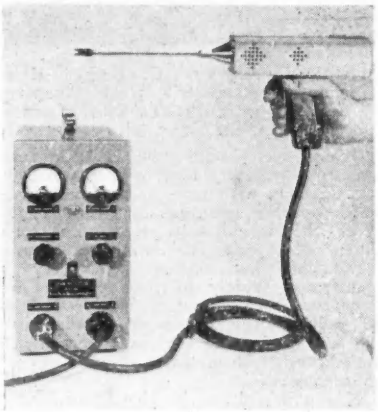
The instrument consists of a detector unit and a control unit. The detector is a hand-held probe with a convenient hand grip and a plastic-tipped metal nozzle. The unit contains an element sensitive to vapours of halogen compounds (those containing chlorine, bromine, iodine, and fluorine) and a motor-driven impeller which draws air through the element.

Audible and Visual Signals

A small loudspeaker built into the detector unit emits an audible clicking which, when the sensitive element detects the presence of vapour of a halogen compound, increases in frequency, giving an audible indication. A visual indication of a leak is given by an increase in the meter reading on the control unit. The instrument will operate from a 190- to 260-volt a.c. supply, the consumption being only 150 W.

The I.C.I. Arcton 6, which has no deleterious effects on components, is the tracer gas used. It is non-toxic, odourless, and can be liquefied at approximately 70 p.s.i. It can, therefore, be conveniently introduced into the system from small cylinders containing 1 to 2 oz. of liquid, giving a concentration at the full testing pressure of about 1 per cent.

The sensitivity of the instrument is such that leaks passing air at the rate of ½ c.c. per min., with a tracer concentration of 1 per cent or less, may be readily detected.



The compact detector and control unit

In terms of a pneumatic system of total capacity 300 to 400 cu. in. operating at 1000 p.s.i., this corresponds to a fall in pressure of 2 p.s.i. per 24 hr. per leak.

It is preferable to inject the required quantity of tracer gas while the pneumatic system is at a reduced pressure, so that on charging to full working pressure the tracer gas is carried into the main reservoirs, thereby greatly accelerating the detection of any leaks. The nozzle of the detector unit is first directed into the main zones of possible leakage in the system, when indication of large leaks from points in these zones will immediately be given by the instrument.

After the correction of major leaks, a more detailed search at all joints will reveal even the smallest leaks, a period of approximately one sec. being sufficient at each point to check for leakage. This technique is applicable to either component, sub-assembly, final test or maintenance service.

It is necessary, in view of the sensitivity of the instrument, to rectify any large leaks before searching for small ones in the same zones, as the contamination of the ambient air in that area would make it difficult to locate accurately any minute leaks.

The leak detector is available commercially for all leak-testing applications.

The Chemist's Bookshelf

ORGANIC CHEMISTRY. G. Bryant Bachman. McGraw-Hill Book Company, Inc. New York, Toronto, London. 1949. Pp. 432. 36s. 6d.

Organic chemistry was until comparatively recently largely a mass of unrelated facts with here and there certain rules covering reactions of specific types. With the development of the electronic theory of organic reactions a systematic foundation for organic chemistry is appearing. Widely different reactions and structural transformations are found to be governed by the same simple laws, the course of many reactions can be predicted, and fresh methods of synthesis can be suggested.

This new volume in the International Chemical Series presents organic chemistry in the light of these modern concepts. Even before any classes of compounds have been separately considered and only the general classification and nomenclature of carbon compounds have been described in two short introductory chapters, the student is introduced to the two basic principles of the theory, (1) *In a given molecule reaction is most apt to occur at that bond possessing the maximum polarity*, and (2) *Those reactions are most apt to occur which lead to the maximum degree of polarity in the bonds formed.* It is shown by numerous examples how these can be applied to illuminate the behaviour of organic compounds and to predict accurately the products of the types of reactions that are most frequently encountered. Thus the student starts his reading of organic chemistry at a considerable advantage.

Similarly, a discussion of electronic resonance is introduced before the study of aromatic compounds in detail, and another basic principle, *viz.*, *Increased resonance always results in increased stability*, is explained at this stage so that the behaviour of benzene derivatives and other cyclic compounds shall be better understood.

The text is intended especially for "non-chemistry majors," *i.e.*, for those students who are taking chemistry as a subsidiary subject in their honours degree course. The field covered by this not very bulky volume is extensive. Indeed, scarcely any of the more specialised branches of the subject are omitted, and the industrial and biological aspects receive much attention. There are chapters on proteins, the chemistry of body processes, physiological action, and synthetic polymers. The treatment in places is scrappy, and methods and materials that have come into prominence within the last year or so are dealt with at greater length than many of those long established in organic chemistry. Nevertheless, the book provides an excellent survey of the whole.

The book is very readable and attractive, and is enlivened by many interesting ancillary remarks. There is a good index and there are useful lists of definitions. A selection of books for further reading is given, but no references to sources appear in the text.

PROCEEDINGS OF THE SECOND RUBBER TECHNOLOGY CONFERENCE. T. R. Dawson, C. M. Blow and G. Gee. Cambridge: W. Heffer & Sons, Ltd. Pp. 523. 63s.

The conference held under the auspices of the Institution of the Rubber Industry, June 23-25, 1948, is fully reported here. The war acted as a stimulus to research and development in the rubber industry such as it had never had before, but, equally, the need for secrecy suppressed from published literature much of the results of this work. A good deal of this information was disclosed at the international meeting now under review, at which 71 organisations, representing 15 countries, took part.

Following each of the 43 papers is a report of the discussion which took place. Noteworthy is the lecture by Shailer L. Bass on silicon rubber, as a new synthetic elastomer, the basic chemical of which is a silicon-to-oxygen linkage that has a bond strength one-and-a-half times as great as the carbon-to-carbon linkage of organic rubber. This, together with the lack of unsaturation in the polymer, makes possible a resilient material that stays elastic from −70° to 500°F., is resistant to weather, chemicals, and oils, and has good dielectric properties.

· PERSONAL ·

THE president of the Royal Society has appointed the following vice-presidents for the ensuing year: SIR THOMAS MERTON, treasurer of the Royal Society; SIR EDWARD SALISBURY, biological secretary of the Royal Society; SIR DAVID BRUNT, physical secretary of the Royal Society; PROF. C. E. TILLEY, professor of mineralogy and petrology in the University of Cambridge.

The National Coal Board has appointed DR. WILLIAM REID to be deputy chairman of the Scottish Divisional Board in succession to Captain T. H. Thorneycroft, who recently resigned. MR. H. R. KING, a deputy production director of the Scottish Divisional Board, has been appointed to succeed Dr. Reid as director.

Among degrees conferred at the University of Edinburgh in December was that of Doctor of Philosophy, in the faculty of science, obtained by MR. LESLIE R. CURRIE. He has been studying the evolution of small-scale quantitative methods of analysis for tin and lead, with reference to the determination in non-ferrous alloys.

MR. JAMES D. CUNNINGHAM has been elected national president for 1950 of the American Society of Mechanical Engineers, of which he has been a member for nearly 30 years.

MR. SIDNEY ABBEY, of Edgerton Bank, Huddersfield, governing director of James Robinson and Co., Ltd., sulphur dyestuffs manufacturers, Hill House Lane, Huddersfield, who died on May 26, left £37,473 (£26,337 net).

The result of the ballot for the election of council members, which was announced at the recent annual general meeting of the British Engineers' Association, in London, was as follows:—MR. W. K. G. ALLEN, MR. A. H. CHILTON. Retiring members re-elected: MR. C. K. F. HAGUE, SIR GREVILLE S. MAGINNESS, MR. ERIC A. ROBINSON, SIR BASIL R. G. TANGYE, MR. D. D. WALKER, MR. J. S. WOODROW.

Obituary

MR. EVAN CHARLES EVANS, of West Kirby, whose death is reported, aged 69, was formerly technical director with Goodlass Wall and Co., Ltd., at Liverpool, with which he had been connected for 52 years.

Mr. Gerald Steel

MR. GERALD STEEL, at present joint managing director of the United Steel Companies, Ltd., becomes sole managing director on the chairman, SIR WALTER BENTON JONES, relinquishing the office of joint managing director on January 1, 1950.

SIR STEVEN BILSLAND, chairman of the Scottish Council (Development and Industry), has accepted an invitation to be a director of the Dollar Exports Board.

New Chemical Department

SIR Robert Robinson, who opened on December 10 the new chemistry department at King's College, Newcastle-upon-Tyne (THE CHEMICAL AGE, *61*, 831) points out that he was incorrectly reported as saying that a new compound could be obtained from urea and methyl alcohol. The two essential ingredients were, in fact, urea and paraffin oil; methyl alcohol functioned only to assist their combination.

Four Years' Diploma Course

Four years' study instead of three will be required in future for the diploma of the Royal Technical College, Glasgow, it was announced on November 26 by the director of the college, Dr. D. S. Anderson, at the annual presentation of awards. It has been evident for some time, he said, that the amount of work required for the diploma could not be satisfactorily covered in three years. The number of day and evening students was the highest in the history of the college.

HOME

Plastics Lecture

A lecture on "Plastics" illustrated by lantern slides and exhibits will be given by Mr. W. S. Dahl at the Borough of Wimbledon Public Library at 8 p.m. on Thursday next (December 29).

G.P.O. Staff Awards

During the quarter ended September 30, 1949, the G.P.O. awards committee gave prizes amounting to £552 for 250 suggestions made by Post Office staff for improving services. The rewards ranged from £1 to £30 for individual suggestions.

Scottish Coal Distillation "Uneconomic"

The Scottish Council (Development and Industry) has indicated that it regards proposals for coal distillation in Scotland as likely to be uneconomic at the present time. This report follows investigation by a sub-committee into the earlier proposals of the Scottish Reconstruction Committee urging the establishment of a distillation plant in Lanarkshire.

London SCI to Amend its Rules

A special meeting of the London Section of the Society of Chemical Industry is to be held on January 2 to discuss the adoption of amendments to the rules, which were drawn up in March, 1918, and have been amended only once since. The proposed alterations principally represent changes in the method of electing or re-electing officers, and bring it into line with common custom.

Trade Promotion in the U.S.A.

Mr. Neville Blond, United Kingdom Trade Adviser in the U.S.A., left for Britain last week-end, having completed the assignment which he undertook in May, 1948. The Office of the U.K. Trade Adviser in the U.S.A. will now be closed. The work is being undertaken regionally by the four Superintending Trade Consuls and their Commercial Advisers based on Consulates-General at New York, New Orleans, San Francisco, and Chicago.

U.S. Investment in Britain

An industrial guaranty contract has been concluded between the Export-Import Bank of Washington, D.C., acting as agent for ECA, and the Barber-Greene Company, Aurora, Illinois, under which the U.S. firm will help to increase British machinery output. The American company will invest $27,180 in its British subsidiary, Barber-Greene-Olding & Co. Ltd., which will be provided as additional working capital to make possible a larger volume of business.

Import of Agar-Agar

The Ministry of Food and the Board of Trade have agreed to facilitate the importation of a limited quantity of agar-agar from Japan under individual licence.

Double Fatality

Leonard Mansley, aged 24, and Thomas Towers, aged 35, both living at Connah's Quay, were killed at Hawarden Bridge Steelworks, Shotton, early on December 13. It is understood that a load of the steel sheets from an overhead conveyor fell on them.

Textile Institute Membership

During 1949 779 new members—more than in any previous year—were elected by the Textile Institute. Of these, more than 200 were under 25 years of age. Since January 1946, 2931 new members have joined the institute, of which the effective membership has increased by over 120 per cent to 4860.

Future of Sunderland Tar Works

It has been announced that the Northern Coal Board does not contemplate taking over the tar-distilling works at Sunderland which are to be vacated by Monsanto Chemicals, Ltd. Sir Mark Hodgson, chairman of the Northern Regional Board for Industry, stated that present distilling works in the area were able to cope with the demand. Efforts were being made to try and interest other firms in the site.

Aid for the Blind

The object of St. Dunstan's is to train a man so that he may go out into the world and take his place as far as possible as a normal worker. The organisation is still a voluntary one, without Government subsidy, and in view of high taxation, many subscribers make use of the covenant method of giving, which enables St. Dunstan's to receive nearly twice as much as is given. Details of this method are obtainable from 191 Marylebone Road, N.W.1.

Scientific Conversazione

A scientific conversazione was held at the Evans Biological Institute on December 14, attended by medical men, pharmacists, dentists, nurses, heads of schools and other professional people in the Runcorn area. Demonstrations were arranged in every department to show modern techniques and developments in medical, pharmaceutical and veterinary research. The Evans Scientific Society is composed of the graduate technical and research staff of Evans Medical Supplies, Ltd.

• OVERSEAS •

Trinidad Crude Oil

The Trinidad Petroleum Development Company reports that its crude oil output for November was 242,410 barrels.

More Uranium for Russia?

Discovery of new uranium deposits in Czechoslovakia has been reported by diplomatic officials in Washington, last week. It is understood that the uranium was sent in raw state to Russia.

Control of Opium Production

Four of the world's principal opium producing countries have agreed to limit official production of the drug to the quantity required for medical and scientific purposes. The countries are India, Persia, Turkey and Yugoslavia.

Belgian Oil Refinery Project

A modern refinery is to be constructed at Antwerp by the Esso Standard Raffinerie, a new company formed by the Standard Oil Co. Construction is expected to take three years, and kerosene, fuel oil, and diesel oil will be supplied to the company's Belgian associates.

Cheaper Fluorine Production

An electrolytic method of producing fluorine is reported to have been developed by E. I. Du Pont de Nemours & Co., as part of its programme of development and application of atomic energy. The new process is claimed to reduce the price of fluorine to $1 a pound.

Holland's New Synthetic Yarn

The A.K.U. (Algemeen Kunstzijde Unie), the Dutch rayon group, will begin next year the manufacture of a new type of nylon yarn which has been given the branded name Enkalon. The chemical composition and the properties of the new yarn are very similar to those of nylon. Most of the raw materials required are available in Holland. The company recently acquired certain patent rights from E. I. Du Pont de Nemours.

Lead and Zinc in French Morocco

A project is announced to develop the lead and zinc mines at Bou Beker in French Morocco with financial assistance from ECA under the Marshall plan. Annual production is expected to reach 85,000 tons of lead concentrate and 120,000 tons of zinc concentrate. This would provide over 70 per cent of France's future lead needs and about 50 per cent of her future zinc requirements.

Salt in S.W. Africa

Webster Marine Salts (Pty.), Ltd., a Cape Town enterprise, intends to exploit the Cape Cross, S.W. Africa, salt occurrencies, estimated at 23 million tons.

U.S. Copper Output Rise

Crude copper production in the U.S.A. in November was 80,778 tons, an increase of more than 11,000 tons over October, reports the Copper Institute. 92,688 tons of refined copper were produced, against 86,882 tons in the previous month.

Resistant Putties

According to reports from Eastern Germany, successful experiments have been carried out in the Buna Works for the manufacture of putties claimed to be resistant to both acids and alkalis. It is stated that the newly developed putties will resist temperatures up to 100°C.

Sandoz Department for Germany

The Sandoz A.G., Basle, Swiss manufacturers of chemicals, pharmaceuticals and dyestuffs, has decided to transfer part of its productive facilities to the vicinity of Lörrach, South Baden, Germany. Negotiations with the German authorities are stated to have been concluded. Construction of the works is to start soon.

More Swedish Iron and Steel

A report by the Swedish Association of Iron Works reveals that exports of iron-ore reached the very high level of 5,670,000 tons in the first six months of this year, an increase of 699,000 tons above the same period of 1948. Total exports of iron and steel increased from 61,000 tons to 74,800 tons. Iron prices on the Swedish market have declined recently by about 5 per cent.

U.S. Aluminium Output Lower

Production of primary aluminium in the U.S.A. in September again showed a decline. The output of 49,742 short tons was 4 per cent lower than the previous month and the lowest total since June, 1948. September was the first month in which the U.S.A. was a net exporter of aluminium in crude and semi-crude form.

Pitchblende Located in Colorado

A mining company official has reported in Denver (Colorado) that a 3600 ft. tunnel in the Rocky Mountains has pierced what may be an important " mother lode " of pitchblende—prime source of uranium. Plans are being made to fan out other tunnels to adjacent areas in a search for more deposits.

PARLIAMENTARY TOPICS

IN the course of a written answer to a question by Mr. A. R. Blackburn concerning research and development since the nationalisation of the coal, gas and electricity industries, the Minister of Fuel (Mr. H. Gaitskell) stated that the National Coal Board had set up its own central research establishment. The Board was co-operating with other research organisations including the Safety in Mines Research Organisation, the Fuel Research Station and the Pneumoconiosis Research Unit; and supported by the British Coal Utilisation Research Association, the Coal Tar Research Association, and the British Coke Research Association. The Gas Council had not yet decided its future organisation of research, but was in the meantime supporting the Gas Research Board. Research and development on a number of projects—such as underground gasification—was being undertaken by his department, such work being directed by the Chief Scientist. A scientific advisory council had also been established to advise on research programmes of the nationalised fuel industries.

IN a later discussion of technical problems arising from the changes in the programme of dismantling in Germany, the Under-Secretary for State for Foreign Affairs (Mr. C. P. Mayhew), replying to Mr. T. C. Skeffington-Lodge regarding synthetic oil plants, emphasised that it was the responsibility of the Military Security Board to ensure that no prohibited items were produced. Equipment at plants dismantled by November 24 was to be removed. The only technical problem was that of the August Thyssen works at Hamborn, and this was now being considered by experts.

Easing Oil and Fat Controls

The Oils and Fats (No. 2) Order, 1949, which comes into force on January 1, 1950, revokes the previous Order and includes the following amendments. Licences are no longer needed for the manufacture or sale by wholesale of certain edible animal fats, oleo oil or technical tallow, but all except the last remain subject to allocation on permit; licences are no longer needed for the sale by wholesale of rape seed oil; maximum price restrictions on sales of home produced technical tallows are removed.

THE DICTATORIAL METHOD

MR. HERBERT MORRISON and other Ministers were vigorously attacked by Sir Ernest Benn last week when the latter claimed that Britain was nearing the end of the blackest five years of its history.

Sir Ernest, who was speaking at the annual meeting of the Society for Individual Freedom, of which he is president, said that Mr. Morrison refused to discuss with the electors such matters as the groundnuts scheme and devaluation. He exhibited to the public what he called a "free Parliamentary democracy," which really meant that it was improper for anyone to make a suggestion, unless it agreed with Mr. Morrison's own views.

In 1945, the Lord President of the Council said that the cost of liberty would involve the sacrifice of some personal freedom. But it was hard to find to-day any personal freedom to sacrifice.

The business classes were already confined by every restraint that any Government could devise—and they were now pilloried as a sort of upper-middle class and threatened that unless they did their duty something else would happen.

Manufacturers were repeatedly told they must increase dollar exports and they were pleased to do so with the greatest possible speed. But a satisfactory flow of goods could not be obtained while exporters' hands were tied.

German-American Collaboration

THE Geary Chemical Corporation and the Pittsburgh Coke and Chemical Company are to form a jointly-owned subsidiary company to produce and market certain new insecticides which have been developed by the West German chemical company Farbenfabriken Bayer.

These insecticides are to be made available for manufacture and distribution in the U.S.A. under the terms of a contract between Bayer and the Geary Chemical Corporation and approved both by the American and British occupation authorities in Western Germany. The agreement with Bayer provides that Bayer will make available to the G.E.C. current and future scientific and manufacturing discoveries in the agricultural and chemical field, as developed in the Bayer laboratories at Leverkusen and Elberfeld. The joint subsidiary to be formed by Pittsburgh Coke and Chemical and G.E.C. will be licensed to manufacture and market some of these. There will be reciprocal exchanges of related technical and scientific information.

Law and Company News

Commercial Intelligence

The following are taken from the printed reports, but we cannot be responsible for errors that may occur.

Mortgages and Charges

(Note.—The Companies Consolidation Act of 1908 provides that every Mortgage or Charge, as described herein, shall be registered within 21 days after its creation, otherwise it shall be void against the liquidator and any creditor. The Act also provides that every company shall, in making its Annual Summary, specify the total amount of debt due from the company in respect of all Mortgages or Charges. The following Mortgages and Charges have been so registered. In each case the total debt, as specified in the last available Annual Summary, is also given—marked with an *—followed by the date of the Summary, but such total may have been reduced.)

MANCHESTER OIL REFINERY, LTD., London, W. (M., 24/12/49.) November 18, charge (subject to, etc.) securing to District Bank, Ltd., all moneys due or to become due from the company to the Bank secured by a mortgage and debenture dated April 4, 1949; charged on certain lands at Barton-upon-Irwell, Davyhulme, together with the buildings, fixed plant, machinery, etc., thereon, and the benefit of covenants, agreements, etc., in the charge mentioned but subject as therein mentioned. *£650,000. June 28, 1949.

Satisfactions

BRITISH CELANESE, LTD., London, W. (M.S., 24/12/49.) Satisfaction November 25, of debenture stock and supplemental deed, respectively registered October 2, 1943, and November 8, 1944, to the extent of £1000.

CARBOMETALS, LTD., London, E.C. (M.S. 24/12/49.) Satisfaction November 24, of debenture registered September 3, 1945.

EAST ANGLIA CHEMICAL CO., LTD., Darlington. (M.S., 24/12/49.) Satisfaction November 23, £12,000, registered April 6, 1949.

Statutory Winding-Up

The statutory winding up of the Pharmaceutical and Allied Chemicals Association, Ltd., was formally completed at its general meeting, held at 166 Piccadilly, London, W.1, on November 23, after the liquidator's statement of account was presented.

Increases of Capital

The following increases in capital have been announced: AERITE, LTD., from £2000 to £3000: BRITISH GENERAL MANUFACTURING CO., LTD., from £5000 to £9500; F. W. HAMPSHIRE & CO., LTD., from £156,250 to £318,750.

Company News

The following dividends have been announced by Powell Duffryn, Ltd.: Interim dividend of 3 per cent actual (less income tax) on the £9,660,471 ordinary stock, for the year ending March 31, 1950. Dividend of 2¾ per cent actual (less income tax) on the £3.6 million 4¾ per cent cumulative preference stock for the half year to December 31, 1949.

Evans Medical Supplies

Evans Medical Supplies, Ltd., will pay today a dividend of 6 per cent, less tax, on the preference stock for the 12 months ending December 31, 1949.

The Distillers Co., Ltd.

The directors of The Distillers Co., Ltd., have declared an interim dividend on the ordinary stock for the year ending March 31, 1950, at 2 2/5d. per unit of 4s., less tax, payable February 28, 1950.

Dorman Long & Co.

The start of the second stage of Dorman Long & Company's major development plan was announced by Sir Ellis Hunter at the company's 60th ordinary general meeting in London on December 15. Over £8 million will be spent on an open hearth steel plant on the Lackenby site with a capacity of 100,000 ingot tons per week, new blast-furnace ancillary equipment and the extension of ore grading plant. The work may be completed by 1952. The Government has refused to agree to the segregation of the company's engineering interests in the event of nationalisation.

New Registrations

Brixley Trading Co., Ltd.

Private company. (476,981.) Capital: £500. Manufacturers of chemicals, gases. Directors: F. G. Sterne, A. A. Kalmus. Reg. office: 33 Mortimer Market, Tottenham Court Road, W.C.1.

D. F. Evans-Hemming & Partners, Ltd.

Private company. (476,022). Capital: £500. Advisers and consultants on all matters relating to management, chemistry, electrical, chemical, heating, ventilating, engineering, horticulture, etc. Directors: Dr. F. Riesenfeld, Douglas F. Evans-Hemming and L. Evans-Hemming and Dr. L. Riesenfeld. Registered office: 42 Monohan Avenue, Purley, Surrey.

The Stock and Chemical Markets

DESPITE less business, stock markets have been firm, industrial shares showing moderate gains over a wide front, regardless of uncertainty in British Funds, which reflected some selling of long-dated stocks. The better trend in industrials was attributed to the view that exporting companies have good prospects of maintaining dividend payments in 1950, and that in most cases yields are not unattractive.

Chemical and kindred shares reflected the better trend, Imperial Chemical improving to 43s. 3d., at which there is a yield of nearly 4⅝ per cent on the basis of last year's 10 per cent dividend. Monsanto 5s. ordinary were 50s., Fisons changed hands at 27s. 6d., and Laporte Chemicals 5s. ordinary at 9s. 6d. Albright & Wilsons were 29s. 6d., Brotherton 10s. shares 19s. 4½d., Amber Chemical 2s. shares 4s. 9d. and British Glues & Chemicals 4s. shares 18s. 6d. Elsewhere, Borax Consolidated have been firm at 58s. 3d., the market continuing to expect the dividend to be maintained.

Turner & Newall at 74s. 9d. turned easier owing to the lower profits shown by the results, although the 15 per cent dividend is maintained with ease and a large proportion of the group's profits again placed to reserves. Amalgamated Metal shares strengthened to 18s. and there was a better tendency in shares of companies concerned with plastics, British Xylonite being 60s., De la Rue 23s. 6d. and British Industrial Plastics 4s. 9d. Elsewhere, British Aluminium at 41s. have been steady and there was demand for Lever & Unilever, which strengthened to 44s. 6d. Glaxo Laboratories rose further to £23 and United Molasses have been prominent with a rise to 41s. 9d. The 4s. units of the Distillers Co. continued to change hands around 18s. Dunlop Rubber were better at 62s. 9d. and British Oxygen, at 90s. 3d., were unaffected by news of the company's South African subsidiary. Triplex Glass (18s.) have held their recent improvement.

Iron and steel shares attracted more attention. Current market prices are well below the scheduled take-over valuations, in the event of nationalisation. United Steel have firmed up to 28s. 1½d., Stewarts & Lloyds to 53s. 3d. and Colvilles to 35s. 9d. Despite the Government's decision not to allow the company to segregate its bridge building and engineering assets, Dorman Long, at 31s. 9d., were also better on balance. Elsewhere, Guest Keen have moved higher to 42s. and T. W. Ward to 56s. General Refractories were firm at 22s. 1½d. and Babcock & Wilcox 60s. 9d.

Boots Drug at 50s. have been active, Beechams deferred were 15s., Griffiths Hughes 21s. 4½d., Sangers 22s. 9d. and British Drug 5s. shares 6s. 6d. Associated Cement further strengthened to 77s. and British Plaster Board 5s. shares were firm at 13s. 9d. Oils have been more active, with Apex (Trinidad) touching 40s. on the financial results.

Market Reports

FIRM price conditions and no outstanding features are reflected in the various sections of the industrial chemicals market. Quotations for home continue at recent levels and little information is available of price adjustments for new contract business; some increases are expected due to the higher cost of raw materials and transport. The general improvement in supply has facilitated contract replacement business and there is a good call from the textile and plastics industries. There is no sign of any lessening in the volume of inquiry for export and a steady flow of bookings for Empire destinations has been maintained. Conditions for coal tar products are unaltered.

MANCHESTER.—Trading in most sections of the Manchester chemical market has disclosed few new bookings and has been quiet, both in regard to the home trade and to shipping business. This, the usual experience at this time of the year, applies to light and heavy chemicals as well as to the general run of fertiliser materials and to the tar products. However, deliveries into actual consumption against contracts have been maintained fairly well, though, here, also, the closing days of the present week were expected to bring about the usual sharp decline, with little prospect of improvement until several days after the holiday.

GLASGOW.—The recent volume of business transacted in the Scottish chemical market has again been slightly above average for the time of the year although it is not believed that consumption has been increased. A slight recession in the volume of business is anticipated in January. The xylol position continues unchanged, supplies being very difficult to obtain. The export market has again been quiet.

Patent Processes in the Chemical Industry

The following information is prepared from the Official Patents Journal. Printed copies of specifications accepted will be obtainable, as soon as printing arrangements permit, from the Patents Office, Southampton Buildings, London, W.C.2, at 2s. each. Higher priced photostat copies are generally available.

Complete Specifications Accepted

Method of and means for the purification and revivification of acid pickling liquors for iron and steel products.—N. Swindin. May 9 1946. 631,525.

Synthetic resins.—E. I. Du Pont de Nemours & Co., D. D. Coffman, and H. W. Jacobson. May 24 1946. 631,590.

Synthesis of aldehydes and other organic oxygen-containing compounds.—E. I. Du Pont de Nemours & Co. June 7 1945. 631,316.

Apparatus for raising natural oils and other liquids by gaseous pressure.—Indo-Burma Petroleum Co., Ltd., N.F.B., Displacement Pump Co., Ltd., and N. F. Brown. July 4 1946. 631,317.

Pesticidal compositions.—B. F. Goodrich Co. July 31 1945. 631,318.

Emulsions of siccative or semi-siccative oils.—Soc. l'Impregnation Soc. A.R.L. Jan. 25 1946. 631,527.

Process for the catalytic synthesis of hydrocarbons.—J. C. Arnold. (Standard Oil Development Co.). Aug. 6 1946. 631,457.

Production of gaseous and liquid fuels from carbonaceous materials.—J. C. Arnold. (Standard Oil Development Co.). Aug. 6 1946. 631,319.

Catalytic synthesis of hydrocarbons.—C. Arnold. (Standard Oil Development Co.). Aug. 23 1946. 631,322.

Apparatus for polaragraphic analysis.—J. E. B. Randles, and L. Airey. Sept. 5 1946. 631,459.

Manufacture of hydrocarbons.—Koppers Co., Inc. March 9 1946. 631,325.

Acrylamide and method of producing same.—American Cyanamid Co. Nov. 8 1945. 631,592.

Pump for operation with liquids having poor lubricating properties. — Dowty Equipment, Ltd., and F. H. Carey. Sept. 28 1946. 631,593.

Method of making alkali metal selenides. —California Research Corporation. Dec. 31 1945. 631,464.

Process and apparatus for the manufacture of nitrogen trichloride.—N.V. De Korenschoofe. Feb. 28 1946. 631,327.

Process for the electrolytic oxidation of aluminium and its alloys by means of alternating current.—Compagnie de Produits Chimiques et Electrometallurgiques Alais, Froges & Camargue. Dec. 19 1945. 631,467.

Process for the manufacture of chromium salts, and pure chromium.—P. Guareschi. Jan. 16 1946. 631,334.

Copolymers of styrene.—Standard Telephones & Cables, Ltd. Feb. 15 1946. 631,341.

Distillation furnaces.—Soc. Anon. Forni Ed Impianti Industriali Ingg. De Bartolomeis. Nov. 27 1941. 631,531.

Heat treatment of metal articles.—British Oxygen Co., Ltd., and R. E. W. Hobling. Feb. 21 1947. 631,396.

Manufacture of glass filaments.—Fibreglass, Ltd., A. De Dani, and R. W. Crosbie. Feb. 22 1947. 631,608.

Moulding compositions.—Dow Chemical Co. March 9 1946. 631,477.

Means for controlling and adjusting the level of liquids in containers.—G. Adlam & Sons, Ltd., and K. F. M. Friendship. March 11 1947. 631,610.

Process for producing a synthetic resinous coating composition. — Monsanto Chemical Co. March 29 1946. 631,479.

Method of purifying solutions of antibacterially active substances derived from the growth of micro-organisms.—K. Abildgaard-Elling [trading as Lovens Kemiske Fabrik Ved. A. Kongsted.]. July 12 1945. 631,349.

Manufacture of solid smokeless fuel.—Standard Oil Development Co Aug. 15 1946. 631,355.

Salt glazing apparatus.—Ferro Enamel Corporation. May 4 1946. 631,613.

Manufacture of pentaenes.—Roche Products, Ltd. (F. Hoffman-La Roche & Co., A.G.). May 6 1947. 631,533.

Device for vaporising materials.—D. E. Pearsall. May 25 1946. 631,487.

Polarograph.—Distillers Co., Ltd., and W. S. D. Wise. May 30 1947. 631,403.

Production of transparent synthetic resins.—Shell Refining & Marketing Co., Ltd., P. J. Garner, and R. E. Bowman. June 4 1947. 631,365.

Amidation of esters.—Lankro Chemicals, Ltd., and E. M. Meade. June 9 1947. 631,367.

Ferrous alloy.—Coast Metals, Inc. Feb. 9 1945. 631,492.

Preparation of organo-siloxane polymers.—Dow Chemical Co. July 8 1946. 631,493.

Preparation of 2-amino-4-hydroxy-6-substituted pteridines.—American Cyanamid Co. July 27 1946. 631,494.

Process for the manufacture of organosilicon compounds.—Dow Corning Corporation, and J. T. Goodwin, Jun. July 1 1947. 631,619.

Aluminium phosphate phosphor.—British Thomson-Houston Co., Ltd. July 15 1946. 631,415.

Protective coatings of polyvinyl resin.—Bakelite, Ltd., C. E. Scoffom, and J. G. Weighall. July 24 1947. 631,372.

Process of preparing hemostatic compositions.—Soc. De l'Institut De Serotherapie Hemopoietique. Feb. 4 1946. 631,502.

Soap compositions.—Lever Bros. & Unilever, Ltd. Sept. 16 1946. 631,421.

Manufacture of synthetic resins.—J. G. Fife. (Dow Corning Corporation). Aug. 26 1947. 631,536.

Ceramic dielectric compositions and methods of regulating the dielectric properties thereof.—C. E. Every. (Titanium Alloy Manufacturing Co.). Aug. 27 1947. 631,486.

Dispersions of fluorine-containing polymers.—E. I. Du Pont de Nemours & Co. Sept. 5 1946. 631,504.

Production of organosilicon compounds.—Dow Corning Corporation. Nov. 25 1946. 631,506.

Processes for the preparation of streptomycin.—Distillers Co., Ltd., and P. D. Coppock. Sept. 19 1947. 631,507.

Interpolymers of a styrene, an allylic fumarate and an allylic alcohol.—United States Rubber Co. Dec. 10 1946. 631,544.

Manufacture of compounds containing phosphorus having insecticidal properties. Pest Control, Ltd., D. W. Pound, and B. C. Saunders. Oct. 17 1947. 631,549.

Carbonisation processes.—I.C.I., Ltd., and F. G. Audas. Oct. 20 1947. 631,551.

Suspensions of tetrafluoroethylene polymers.—E. I. Du Pont de Nemours & Co. Nov. 30 1946. 631,570.

Process for the manufacture of a pteridine derivative.—Roche Products, Ltd. (F. Hoffman-La Roche & Co., A.G.). Dec. 19 1947. 631,516.

Production of phenanthridine compounds.—May & Baker, Ltd., H. J. Barber, S. J. Holt, and W. R. Wragg. Dec. 24 1947. 631,651.

Production of hypochlorous acid gas.—J. Noel-Davies. March 12 1946. 631,796.

Method for alkylating-benzene.—Compagnie Française de Raffinage. Dec. 18 1943. 631,874.

Process for fritting of articles consisting essentially of a hard carbide such as tungsten carbide.—Regie Nationale des Usines Renault. May 17 1940. 631,666.

Apparatus for weighing a continuous stream of material during flow.—Buhler Bros. Aug. 6 1945. 631,802.

Forming protective coatings on metal articles.—H. M. Freud. Aug. 7 1945. 631,667.

Process for the recovery of water-soluble plant substances such as ascorbic acid and also fat soluble vitamins, provitamins and other non-saponifiable constituents from chlorophyll-containing parts of vegetable materials.—A. Heilmann. Aug. 24 1945. 631,731.

Production of organic chlorine compounds.—Dominion Tar & Chemical Co., Ltd. March 27 1945. 631,669.

1-Substituted-3-cyanoguanidines and 1, 5 substituted-biguanides and method of preparing same.—American Cyanamid Co. Sept. 11 1945. 631,878.

Process of and apparatus for producing carbon black.—Phillips Petroleum Co. Nov. 6 1944. 631,736.

Preparation of amphoteric amides of acrylic acid and their polymers.—General Aniline & Film Corporation. Oct. 16 1945. 631,738.

Means for use in sealing air or gas passages and/or ducts.—Air Control Installations, Ltd. Oct. 3 1946. 631,957.

Pigment-dyeing of fabrics.—Interchemical Corporation. Nov. 9 1945. 631,882.

Growing crystals.—Brush Development Co. Nov. 10 1945. 631,670.

Separation of organic nitrogen compounds.—I.C.I., Ltd., and W. Tyerman. Nov. 29 1946. 631,672.

Process for the manufacture of artificial carbon bodies.—Soc. Anon. pour l'Industrie de l'Aluminium. Dec. 28 1945. 631,813.

Manufacture of tetryl.—Olin Industries, Inc. March 31 1943. 631,814.

Apparatus for vulcanising rubber.—Dunlop Rubber Co., Ltd., and T. J. R. Dibdin. Feb. 11 1947. 631,888.

Process for the synthesis of hydrocarbons.—C. Arnold. (Standard Oil Development Co.). Feb. 28 1947. 631,682.

Preparation of piperazine mono carboxamides.—American Cyanamid Co. April 12 1946. 631,685.

Protection of magnesium and magnesium base alloys against corrosion.—Magnesium Elektron, Ltd., S. E. Mayer, and W. F. Higgins. April 3 1947. 631,686.

Process and apparatus for treating electrolytically-tinned ferrous metal strip.—Carnegie Illinois Steel Corporation. April 23 1946. 631,687.

Alkyl and di-alkylamino-alkyl and analogous pyridazones.—Sir W. N. Haworth, and L. F. Wiggins. April 11 1947. 631,755.

Method of preparing triacylmelamines.—Monsanto Chemical Co. Nov. 27 1946. 631,757.

Thermochemically removing metal from metals and alloys.—Linde Air Products Co. May 16 1946. 631,689.

Method of and apparatus for recovering liquid from a filter system.—Prosperity Co., Inc. Aug. 19 1939. 631,828.

Colouring of oxide-coated aluminium and aluminium alloy articles—Aluminum Co. of America. June 27 1940. 631,829.

Process for the production of cycloparaffins.—N.V. De Bataafsche Petroleum Maatschappij. Oct. 18 1946. 631,831.

Mordant dyeing process and product.—General Aniline & Film Corporation. March 13 1945. 631,765.

Diazotype layers containing resorcinal monoesters.—General Aniline & Film Corporation. June 22 1946. 631,896.

Process for the production of cyclohexane.—N.V. De Bataafsche Petroleum Maatschappij. Nov. 6 1946. 631,699.

Process of removing hydrogen sulphide from hydrocarbon liquids.—Girdler Corporation. March 12 1943. 631,704.

Process for the purification of spent sulphuric acid.—Standard Oil Development Co. Jan. 10 1947. 631,708.

Polymerisable materials and the polymerisation thereof.—E. I. Du Pont de Nemours & Co. Aug. 7 1946. 631,844.

Stabilisers for vinyl resins.—United States Rubber Co. Oct. 29 1946. 631,909.

Oxazoles and cyanine dyestuffs and photographic emulsions containing such dyestuffs.—E. I. Du Pont de Nemours & Co. Aug. 21 1946. 631,848.

Moulding compositions containing acrylic polymers and the application thereof.—S. A. Leader. Oct. 7 1947. 631,917.

Treatment of fatty oils.—Lever Bros. & Unilever, Ltd., and R. J. Taylor. Nov. 19 1947. 631,722.

Halogenation of aromatic hydrocarbons.—Lummus Co. June 22 1942. 632,144.

Methods of dehydrogenating aliphatic hydrocarbons.—Koppers Co., Inc. Dec. 31 1943. 632,291.

Method and plants for obtaining precipitates easy to separate from the liquid medium.—J. C. Seailles. Sept. 20 1943. 632,076.

Pesticides.—B. F. Goodrich Co. April 2 1945. 632,154.

Carbonisation of coal.—Institute of Gas Technology. June 7 1945. 632,155.

Extraction of alumina from raw calcium aluminates.—Soc. Des Cimento Français. May 6 1942. 632,079.

Gelatin compositions of increased viscosity.—General Aniline & Film Corporation. Nov. 24 1945. 632,174.

Synthetic resins.—I.C.I., Ltd., N. M. Beyts, J M. J. De M. Estevez, and W. R. Davis. Nov. 7 1946. 632,177.

Heterocyclic sulphur compounds and process for preparing same.—Texaco Development Corporation. Nov. 21 1945. 632,306.

Aspirators for the sampling or testing of gases. L. T. Minchin. Nov. 15 1946. 632,179.

Process for the preparation of solutions containing sodium hydroxide. — N.V. Koninklijke Nederlandsche Zoutindustrie. Aug. 3 1945. 632,081.

Catalytic reactions.—Baker & Co., Inc. Dec. 10 1945. 63,2182.

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EDUCATIONAL

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No. 206 One **DITTO** of the same pattern, by **DOBSON & BARLOW.**

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No. 208 One **DITTO** by **WERNER PFLEIDERER,** with a C.I. built pan or mixing chamber, of the double "U" type, 4 ft. 5 in. long by 3 ft. 8 in. by 33 in. deep, with double "Z" mixing arms, gears at each end, hand-operated tilting gear, with steel backframe, counterbalancing weights and chains, and fast and loose pulleys 3 ft. diam. by 6 in. face.

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Printed in Great Britain by THE PRESS AT COOMBELANDS, Ltd., Addlestone, and published by BENN BROTHERS LTD., at Bouverie House, 154, Fleet Street, E.C.4 24 December 1949. Registered at the General Post Office. Entered as Second Class Matter at the New York U.S.A., Post Office.